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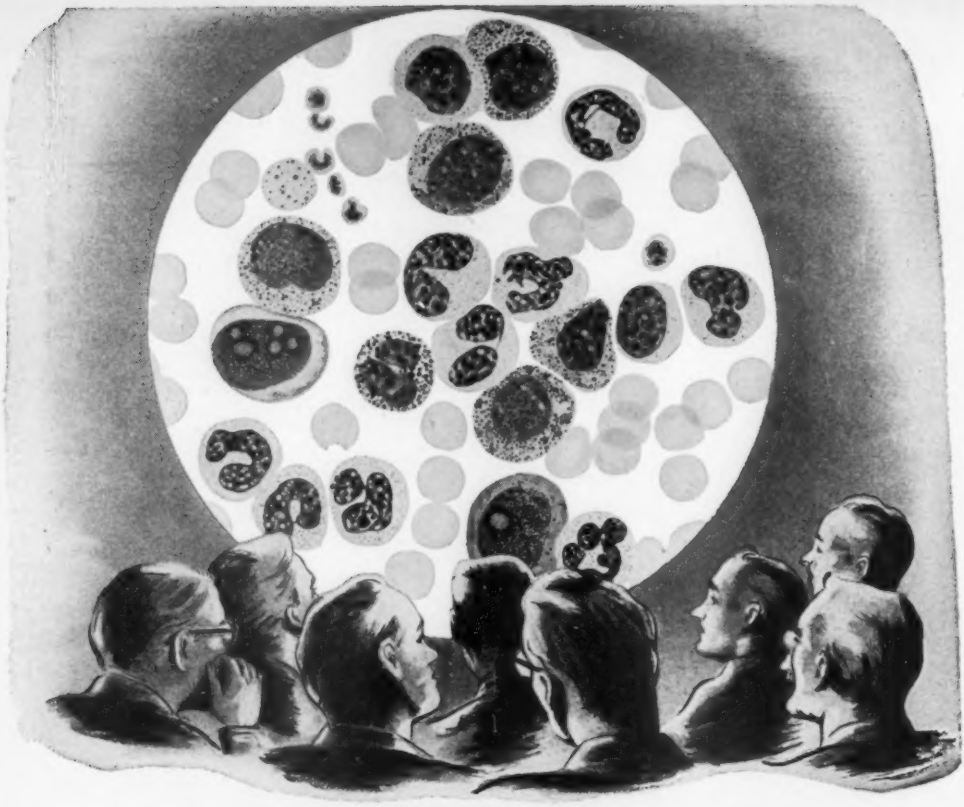

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Chicago Museum Field Work

At almost any time, somewhere in the world, scientists—solo, in twos or threes, or in larger groups—are collecting something for one of the four departments (Anthropology, Botany, Geology, Zoology) of the Chicago Natural History Museum. Ever since the institution (formerly the Field Museum of Natural History) was founded in 1893, its worldwide expeditionary program has been continuous, except when war has caused temporary interruption. In recent years the number of parties dispatched on field operations has ranged from sixteen to more than twenty annually. All continents and many island groups and sea areas have been explored. Museum scientists have penetrated tropical rain forests and jungles, mountain fastnesses, dismal expanses of desert, and all other sorts of terrain, including the depths of the sea, in the search for material to add to the collections, and in quest of data for contributions to scientific knowledge. Many of the expeditions have been large in scale; but the one- and two-man parties are the most numerous and carry on the bulk of ordinary expeditionary activity.

The largest and most ambitious undertaking in the 1952 program was the Southwest Archaeological Expedition. This was its eighteenth year of operation and the ninth in which its work has been concentrated on prehistoric Mogollon Indian sites near the town of Reserve, New Mexico. Over the years it has been assembling pottery, implements, clothing, and other artifacts, and from them reconstructing the history of tribes that lived from about 2500 B.C. to A.D. 1300. Since its inception, this series of expeditions has been directed by Paul S. Martin, chief curator of anthropology. In 1952 his principal aides were John Rinaldo, assistant curator of archaeology, and Elaine Bluhm, assistant in archaeology.

An important zoological expedition to Kenya Colony and the Upper Nile region of Uganda, sponsored and led by Walther Buchen, of Chicago, collected birds required for a projected habitat group showing the teeming bird life of a papyrus marsh. Dominated by whalehead storks, the group will also include cormorants, pelicans, water herons, plovers, ducks, and other birds. Mrs. Buchen, who participated actively in the collecting, and a British ornithologist, John Williams, joined the party in Nairobi.

Other expeditions in 1952 included the following: A zoological survey of Colombia, in progress for nearly four years, was completed by Philip Hershkovitz, assistant curator of mammals. Harry Hoogstraal, field associate in zoology, continued collecting small mammals, reptiles, insects, birds, and fishes in Africa, Madagascar, and Yemen. Luis de la Torre completed his third expedition to Guatemala, in search of small mammals. Harry A. Beatty, of New York, collected birds in West Africa. D. S. Rabor, of Silliman University, assembled a collection of mammals and birds in Zamboanga, Philippine Islands. Margery Carlson, Northwestern University botanist, gathered plants for the university and the museum in Mexico, Guatemala, El Salvador, and Honduras. Clifford H. Pope, curator of amphibians and reptiles, collected salamanders in Mexico. Fritz Haas, curator of lower invertebrates, made collecting trips to Cuba and Florida, and field work in Cuba was conducted by B. E. Dahlgren, curator emeritus of botany. Scheduled for December is an expedition to Parícutin by Sharat K. Roy, chief curator of geology. Bryan Patterson, curator of fossil mammals, is in Argentina for a year of paleontological studies on a John Simon Guggenheim Fellowship. Rainer Zangerl, curator of fossil reptiles, made paleontological surveys in Austria.

Ore specimens from Utah and Colorado; fossil fish from Pennsylvania, New Jersey, and New Brunswick; fossil mammals from Texas; fossil invertebrates and plants from Illinois, Indiana, and Tennessee; and beetles from the Southwest were other additions made to the museum's collections by staff field work in the season that has just closed.

H. B. Harte

Chicago Natural History Museum

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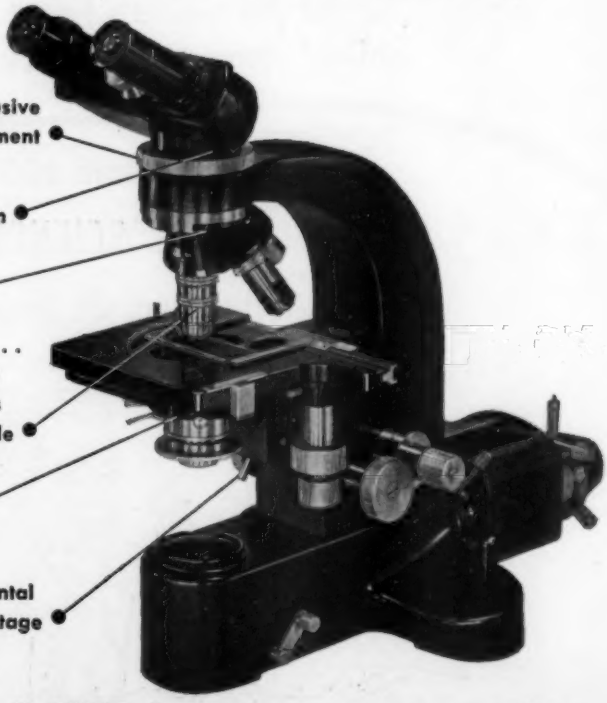

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Chicago Radiocarbon Dates, III[1]

W. F. Libby

Institute for Nuclear Studies and *Department of Chemistry*
University of Chicago, Chicago, Illinois

THE DATES OBTAINED since the publication of the first and second date lists (*1–3*) are presented below. This list covers the period September 1, 1951, to September 1, 1952. The dates quoted are based on 5568 ± 30 years as the half-life of radiocarbon (*3*). The number of runs is indicated by the number of dates listed, unless they were merely remeasurements of the carbon obtained from an earlier combustion, in which case brackets are placed around the set of dates involved. Remeasurement always involved rewashing the sample with acid for cleaning; otherwise, separate portions of the original samples were processed and measured. Counting time has been limited to 48 hours in most cases.

The numbering of samples and the file names we have used (which appear in parentheses when two names are given) are entirely our own and not those of the donors and collaborators. We prefix "C" to our numbers to distinguish them from the sample numbers from other laboratories.

RADIOCARBON DATES

I. *Mesopotamia and Western Asia*
(Principal collaborators: R. J. Braidwood, T. Jacobsen, Richard A. Parker, and Saul Weinberg)

Our No.	Sample	Age (years)
	A. Egypt	
C-753 and C-754	*Shaheinab near Khartoum, Sudan*: This ancient site may be the clue as to whether some elements in Egyptian civilization came from Africa northward. The site is about 1200 miles from the Egyptian Fayum (Samples 457, 550, 551—the Egyptian granaries, which dated 6240 years); and the archaeological connection with the Fayum Neolithic is close. Collected in 1949 by A. J. Arkell, Department of Egyptology, University College, London. Submitted by R. J. Braidwood, Oriental Institute, University of Chicago.	

[1] The author gratefully acknowledges the generous financial support of the John Simon Guggenheim Memorial Foundation, the Geological Society of America, and the Wenner-Gren Foundation for Anthropological Research, a portion of whose original grant still remains. He also wishes to thank the members of the Committee on Carbon 14 and the several other archaeologists and geologists who have given advice about selection and identification of samples from time to time.

RADIOCARBON DATES—(*Continued*)

Our No.	Sample	Age (years)
C-753	*Shaheinab Charcoal*: Two lots, one marked "N80, 20–40" and the other "066(5)."	5060 ± 450
C-754	*Shaheinab Shell*: Bivalve shells from Shaheinab, apparently in fairly unaltered condition.	5446 ± 380
	C. Iraq	
C-742	*Jarmo, Iraq* (*Jarmo II*): Jarmo is an early village site in the *liwa* of Kirkuk, Iraq, midway between the towns of Kirkuk and Sulimaniyah. This site is early Neolithic and exhibits the earliest traces of an established food-producing village economy in the "nuclear" Near East. Only the upper third of the site yielded portable pottery, but there was a well-established architectural manifestation throughout the 7.10 m of depth, and traces of about a dozen "floors," or building renovations. An excavation labeled I was made clear to virgin soil near one edge of the mound. Eight floors were found. A second excavation, labeled II, was made at the highest point. This went down 4 m through the sixth floor, which is still 3.2 m above virgin soil. The sixth floor of II is equivalent to the third floor of I, and the second floor of II is equivalent to the first floor of I. The earlier Jarmo sample (113), consisting of shell, came from the seventh floor of I. It dated at 6707 ± 320 years. The present sample, consisting of flecks of charcoal collected by the pickmen as they cleared the levels, came from the same spot as the earlier shell sample. Especially for the deep floors, such as the seventh, the character of the fine-grained *touf* debris and of the *touf* walls themselves was such as to give absolute confidence in the undisturbed nature of the locality. Collected and submitted by R. J. Braidwood.	6606 ± 330
C-743	*Jarmo, Iraq* (*Jarmo III*): Charcoal from fifth floor of	6695 ± 360

Our No.	Sample	Age (years)
	excavation II (*cf.* Samples 742 and 113). Submitted by R. J. Braidwood.	
II.	*Western Europe* (Principal collaborators: H. L. Movius, Jr., E. S. Deevey, Jr., and R. F. Flint)	
	F. Netherlands	
C-621–C-627	*Dutch Prehistoric*: Charcoal and wood samples covering a considerable range in the chronologic column of the Netherlands beginning in the Mesolithic (627). Submitted by A. E. van Giffen, director, Biological-Archaeological Institute, Groningen.	
C-627	*Dutch I*: Charcoal from Mesolithic site in the Netherlands. Donor's label: "Haule I Fr. Mesolithic, Netherlands, ca. 5000 B.C." Donor's sample No. A.	7965 ± 370
C-623	*Dutch Bronze Age*: Charcoal from Province of Drente, thought to be of Bronze Age. Donor's label: "Oudemolen, Comm. Vries, Prov. Drenthe, Tumulus 3. 2-period-barrow. Bronze Age." Donor's sample No. 15.	2523 ± 200 2602 ± 290 Av 2562 ± 175
C-621	*Groningen*: Wood from round church at St. Walburg in tower of Groningen. Piece of wooden post. Earliest ecclesiastical construction at St. Walburg can be dated at the third century A.D. at the latest. Possibly some buildings existed on this site as early as the second century; it is important to know whether such structural features are actually associated with early churches in the Netherlands.	2222 ± 200
	G. Iceland	
C-749	*History of the Geomagnetic Field, Reykjavik, Iceland (Iceland Peat)*: The direction of the earth's magnetic field is recorded by solidifying lavas, as of the time of solidification, by the permanent polarization of the lava. Near Ellidhaá Bridge near Reykjavik, a lava flow occurs with polarization roughly parallel to the present geomagnetic field. It happened to flow over postglacial peat, which constitutes the sample. Its date correlates directly with that of the flow. Submitted by B. C. Browne and J. Hospers, Department of Geodesy and Geophysics, Cambridge University, England.	5300 ± 340
III.	*United States and Canada* (Principal collaborators: E. S. Deevey, Jr., R. F. Flint, J. B. Griffin, R. F. Heizer, F. Johnson, F. H. H. Roberts, and W. S. Webb.)	
	A. Canada	
C-608	*Burley Site, Lake Huron*: Charcoal from Occupational Horizon No. 1 from the Burley Site, located on the northern terrace, formerly mouth of the Ausable River, about 1 mi from Lake Huron. This was an old Indian dwelling site. The profile is: (*a*) sand below the 12′ level above the lake; (*b*) Occupational Horizon No. 1, consisting of dark sand of the most ancient occupational level; the charcoal, which was taken from this level, lies between the 12′ and 14′ elevations; (*c*) stratified alluvial sand with shells of fresh-water snails up to 15′–17′; (*d*) second occupational level (No. 2), ½′–1′ thick; (*e*) light-gray sand ½′–1′ thick; (*f*) dark sand of the most recent occupational horizon (No. 3); (*g*) top cover of windblown sand, 1′–2′ thick, 18′–20′ above the present lake level. It is believed that this may date from the early one-outlet stage of the Nipissing Great Lakes. Collected by W. Jury, 1950. Submitted by A. Dreimanis, University of Western Ontario, London.	2619 ± 220
	C. Illinois, Indiana, Iowa, Kentucky, Ohio, and Pennsylvania	
C-674	*Lake Chicago Sands, Chicago (Tolleston)*: Wood from Lake Chicago sands on University of Chicago campus, corner 58th St. and Ellis Ave., surface elevation 592′. Found in horizontal position overlain by stratified sand at depth of 14′, according to workman who found it. The section at this locality is sand stratified with some silt layers, 0′–19′; blue clay (till) with some sand and gravel, 19′–57′. Professors Bretz and Horberg, of the University of Chicago, are of the opinion that this sand represents a Tolleston and post-Tolleston lake deposit and that at a depth of 14′ the sand is probably Tolleston. Low	8200 ± 480

Our No.	Sample	Age (years)
	beach ridges superposed on the sand at the location occupy the position of the Algoma stage of the lake. Submitted by Leland Horberg, Department of Geology, University of Chicago.	
C-684	*Wilson Hopewell Site, White Co., Illinois (Wilson Hopewell)*: Charcoal from a fire pit in the corner of a log tomb in Mound Wh °6 in White Co., Ill. (Wilson Site). This fire pit was in association with 7 burials, grave goods of positive Hopewellian affiliation. There was evidence in the stratigraphic profiles that there was no intrusion into the tomb in recent times and that the charcoal is therefore of definite Hopewellian origin. There were deposits of reworked limestone throughout the fill of the mound, and the log roofing rafters over the tomb were largely discernible because of this redeposited limestone. Collected by Melvin Fowler, Illinois State Museum, Springfield. Submitted by Fred Eggan, University of Chicago.	710 ± 310 736 ± 200 Av 723 ± 180
C-675	*Plum Creek, Dyer, Indiana (Calumet)*: Wood from alluvial fill along Plum Creek near Dyer (SW¼ SE¼ sec 32, T.35 N, R.15 E). The specimen was found at a depth of about 10′ in the alluvial fill and about 2′ above the base, which was in contact with glacial fill. Fill represents the Calumet and post-Calumet deposit (Bretz, *Illinois Geol. Survey Bull. 65*, 117 [1939]), and the wood from near the base of the fill is probably of Calumet age. Shells, a mammoth tooth, and numerous fragments of deer antlers are associated. The shells, identified by F. C. Baker, differ from those found in definitely dated Tolleston sediments. Collected by H. Bretz and L. Horberg. Submitted by L. Horberg.	1850 ± 480
C-664	*Skunk River, Iowa (Ames Top Drift)*: Wood from the Ames quarry (*cf.* Samples 596, 653, which dated 11,952 ± 500 and 12,200 ± 500). This wood, unlike the earlier samples, is not from the till but from a zone about 1′ thick of stratified sand and silt lying between the upper and lower tills at a depth of 28′ from the surface. The top of this stratified zone contains occasional root fragments, seemingly in place. This sample probably came from the stump of a tree that grew where it was found. Collected by Wayne Williams and Bob Tench. Submitted by C. S. Gwynne, Iowa State College, Ames.	14,042 ± 1000

Our No.	Sample	Age (years)
C-653	*Skunk River, Iowa (Ames)*: Glacial wood from the same quarry as Sample No. 596. It consisted of about 12 pieces up to 6″ in length and 1″ or 2″ in diameter. They all came originally from one piece of wood situated in a small pocket of sand in the same till as sample No. 596. The sand pocket was about 3′ above and 12′ west of the position of the other piece of wood. Submitted by C. S. Gwynne.	12,161 ± 540 12,286 ± 800 Av 12,200 ± 500
C-596	*Skunk River, Iowa (Cary II)*: Glacial wood from quarry near Ames. Found in the center of NW¼ sec 24, T.84 N, R.24 W, Story Co., on east side of Skunk River about 90′ above the valley bottom. Desiccated swell and swale upland bordering the Skunk River; maximum relief of 120′ reached about ½ mi southeast of the river, now modified by quarrying operations (see USGS Topogr. Quadr., Ames, Iowa [1914]). The stratigraphy is Mankato till about 30′ thick above the Mississippian limestone bedrock. The sample, which consisted of wood, was found about 25′ below the surface in the unoxidized zone, which was gray, dry, and very hard, and had to be blasted to remove the sample. The layer consisted of fine clay, silt, and sand, most of it with some pebbles present. The oxidized to unoxidized gradational boundary occurred about 12′ below the surface, which was covered with timber. The sample was about 3″ in diameter and 2′ long before blasting to remove. Collected by Ronald E. Wilcox, Department of Geology, Iowa State College, Ames. Submitted by R. F. Flint, Yale University.	10,369 ± 700 12,798 ± 660 Av 11,952 ± 500
C-738 to C-741	*Archaic Kentucky Indian Sites*	
C-738	*Annis Shell Mound Butler Co.*	4289 ± 300

Our No.	Sample	Age (years)
	(*Kentucky Archaic I*): Deer antler from the 1.5′, 2.0′ and 2.5′ levels at Site Bt 5, the Annis shell mound. This sample was taken entirely from a band 1.5′ thick, the top of which was within 1′ of the mound surface. It is to be correlated with Samples 116, 180, and 251 from the same mound, which gave 5149 ± 300, 7374 ± 500, and 4900 ± 250, respectively. However, 116 and 180 consisted of rather powdery shell, which was somewhat dubious; 251 was deer antler from the 6.5′ level. Submitted by W. S. Webb, University of Kentucky.	
C-739	*Annis Shell Mound, Butler Co.* (*Kentucky Archaic II*): Deer antler from the 5.5′, 6.0′, 6.5′, and 7.0′ levels. This sample came from a band 2′ thick at the bottom of the mound. Again this sample should correlate with Samples 116, 180, and 251, as well as with Sample 738. Sample 251 was from the same level. Submitted by W. S. Webb.	4333 ± 450
C-740	*Indian Knoll Shell Mound, Ohio Co.* (*Kentucky Archaic III*): Deer antler from a band ½′ thick at the 1′ level. This material is similar to Sample 254, which gave 5302 ± 300. Submitted by W. S. Webb.	4282 ± 250
C-741	*Indian Knoll Shell Mound, Ohio Co.* (*Kentucky Archaic IV*): Deer antler from the 4.5′ level, from a band ½′ thick near the bottom of the mound. The total depth of the mound is 7′. This is the same site as Samples 254 and 740. Submitted by W. S. Webb.	3963 ± 350
	D. Alabama, North Carolina, South Carolina, and West Virginia	
C-755 and C-756	*Perry Site Shell Mound, Lu°25, Tennessee River, Alabama* (*Alabama Archaic*): Deer antler from the 4′ level (Sample 755) and the 3.5′ level (Sample 756), mixed about equally to afford sufficient carbon for measurement. The Perry Site, Lu°25, Unit 1 (*cf.* Bull. 129, Bur. Am. Ethnol. [1942], by W. S. Webb and D. L. DeJarnette) was an ancient shell mound about 500 yards from the upper end of Seven Mile Island, which lies between the Wilson and Pickwick dams on the Tennessee River in Alabama. It was 200′ by 300′ and about 10′ thick at its thickest point. The archaeological stratigraphy indicates that the Alabama shell mounds began earlier than those in Kentucky (Annis and Indian Knoll; Samples 116, 180, 251, 254, 738, 739, 740, and 741). These samples, together with those from the Archaic Kentucky mounds, indicate when archaic man ceased to build shell mounds in the Southeastern U. S. Presumably this occurred when he had developed an economy independent of shellfish as a staple food supply. Submitted by W. S. Webb.	4764 ± 250
	E. Louisiana, Mississippi, Missouri, Nebraska, and Texas	
C-645, C-647, and C-649	*Soil, Red Cloud, Nebraska*; Buried soils from Schultz' Terraces Nos. 1 and 2, south of Red Cloud. Terrace 1 is thought to be 2000–3000 years old, although several buried soils of rather weak profile development exist here, and there could be a fairly wide range of age. The soil actually taken on Terrace 1 was the lower part of a sort of double profile with a very thin horizon of light-colored material separating the layers. The Terrace 2 material should correlate very closely to the charcoal date—i.e., 9000–10,000 years. A serious effort was made at all points to exclude rootlets from the sample. Samples collected in 1949 by E. C. Reed, C. B. Schultz, H. Waite, and James Thorp. The organic matter in the soils analyzed: No. 645, 0.66% C; No. 647, 0.45% C; No. 649, 0.47% C. J. W. Borland, of the Beltsville Laboratories, Division of Soil Survey, U. S. Department of Agriculture, extracted these small amounts of carbon from the soil samples, preparing barium carbonate which was submitted for analysis by James Thorp, Department of Botany. Earlham College, Richmond, Ind.	
C-645	*Soil Terrace II*: Soil sample from Terrace 2. Taken from a level about 30′ below the top of Terrace 2. Buried by loess, it came from a dark grayish-brown and rust-mottled buried soil about 18″–2′ thick. It lay	7809 ± 400

Our No.	Sample	Age (years)
	about 100 yards from sample No. 647.	
C-647	*Nebraska Soil*: Soil sample from Terrace 2. Taken from a level about 30′ below the top of Terrace 2 from a dark grayish-brown and rust-mottled buried soil about 18″–2″ thick. It lay about 100 yards from sample No. 645.	7426 ± 600
C-649	*Soil Terrace I*: Soil sample from Terrace 1. Following is a cross section from the surface down: 0″–18″, dark grayish-brown, crumb-structured, calcareous silt loam; 18″–24″, calcareous loess; 24″–36″, black, granular, calcareous silt loam (a buried soil); 36″–48″, pale-brown, calcareous loess with white line threads; 48″–84″, pale-brown calcareous laminated silt and silty clay loam; 84″–92″, light grayish-brown. calcareous silt loam with prismatic structure (a weakly developed buried soil representing a short period of slow accumulation); 92″–110″, black granular calcareous silty clay loam (black when wet; a buried soil); 110″–120″, light grayish-brown calcareous silt loam, either loess or alluvial silt; 120″–134″, dark-gray granular calcareous silty clay loam. This is the A horizon of the buried soil that was sampled (sample No. 649) (the buried soils above this level have many modern grass and tree roots); 134″–156″, prismatic calcareous heavy silt loam; 156″–216″, coarse prismatic calcareous loesslike silt loam. The flood plain of Louisa Creek lies 27′ below the top of Terrace 1 at this point.	4150 ± 350
C-698	*Kincaid Shelter, Edwards Plateau, Texas* (*Kincaid*): Charcoal from the Kincaid Cave, Edwards Plateau, Texas. The cave yielded a remarkably complete sequence of archaeological and faunal stages, ranging from early man levels at the bottom to late prehistoric Indian horizons at the top. This sample is from near the top, the deeper samples having had too little charcoal to measure. This sample is from 20″ below the surface in a fire pit, Bed #6, dark-grey zone of burned rock; Square G-H: B-9 (Square	1212 ± 300

Our No.	Sample	Age (years)
	#4 near). Collected in 1951. Donor's sample No. 4. Submitted by Glen L. Evans, Texas Memorial Museum, Austin.	
	F. Arizona, California, Colorado, and New Mexico	
C-631	*California Crude I*: Crude oil taken from depth of 1100′ in the Tulare formation of Upper Pliocene age at the South Belridge field in Kern Co., Calif. This oil, together with that of Sample 632, is from the youngest productive horizons known to the Shell Oil Co. Submitted by M. E. Spaght, Shell Development Co., Emeryville, Calif.	Older than 24,000
C-632	*California Crude II*: Crude oil from the Upper or Middle Pico formation of Upper Pliocene age, from the Padre Canyon field in Ventura Co., Calif. The actual well was Hobson B 47-1 of the Chanslor-Canfield Midway Oil Co. This, together with Sample 631, constitute the youngest crude oil samples measured. Submitted by M. E. Spaght.	Older than 27,780
C-617	*Deep Peat Bed, San Joaquin Valley, California* (*San Joaquin*): Peat from well dug by Bureau of Reclamation near Tranquillity, Calif., in studying ground water conditions of the San Joaquin Valley in connection with Central Valley Project. Peat found at depth of about 550′. A silty clay overlaid the peat, and a clay stone lay beneath it. The bed itself was about 1′ thick. The flecks of wood were not replaced. The condition described prevails over an area of three townships in this vicinity, and the clay stone underlying the peat can be traced for at least 50 miles along the central part of the San Joaquin Valley. Age was desired to fix rate of deposition of the 500′ of alluvial sediments on the valley floor. Donor's sample No. 15-16-12B. Submitted by E. F. Sullivan and Phil Dickinson, acting district managers, Bureau of Reclamation, Region 2, Fresno, Calif.	Older than 17,800
C-673	*Medicine Lake Highlands, California* (*Medicine Lake*): A variety of hard pine found buried under the youngest pumice deposits of the Medicine Lake Highlands of northern California. This wood dates	[1660 ± 300 1107 ± 380] Av 1360 ± 240

Our No.	Sample	Age (years)
	the final volcanic eruptions in this country and gives a maximum age for the huge flows of obsidian found in the vicinity of Medicine Lake. Submitted by Howel Williams, Department of Geology, University of California, Berkeley.	
C-695	*Big Sur, Monterey Co., California* (*Big Sur II*): Charcoal from shell midden on California coast at mouth of Willow Creek about 30 mi south of Big Sur, Monterey Co. Midden overlain by 10′ of gravels. Present beach gravels submerge 4.5′ of midden, indicating shore subsidence (*cf.* Sample 628 for another sample of charcoal from this midden. This date was 1879 ± 250). The charcoal in this sample came from the base of the midden. Submitted by R. F. Heizer, University of California, Berkeley.	1840 ± 400
C-659	*Indian Midden Shell, Lower California* (*Lower California Shell*): Shell from Indian middens at Punta Clara and vicinity in Lower California. Shells were cryptochiton. Harold C. Urey measured their temperature of formation to be 15° C and concluded no oxygen exchange of importance had occurred. Submitted by Carl L. Hubbs, Scripps Institution of Oceanography, La Jolla, Calif.	1063 ± 160 716 ± 130 Av 889 ± 100
C-451	*Lindenmeier Site, Colorado* (*Lindenmeier*): Charcoal obtained from a hearth in the fill of a secondary channel. Geologic evidence indicated that the age of the hearth should be approximately half that of the occupational level from which the Folsom material was taken. Submitted by Frank H. H. Roberts, Smithsonian Institution.	5020 ± 300
	G. Nevada, Oregon, and Utah	
C-657	*Newberry Crater, Oregon* (*Newberry*): Charcoal from Newberry Crater, Ore. Dates the final eruption of the volcano. The pumice covering the Fort Rock Cave (sandals, sample No. 428) came from one or the other of the Newberry Crater cones. This shows whether the Fort Rock pumice is coeval with Big Pumice Cone and whether Newberry continued active after the great Mount Mazama eruption, which made Crater Lake. Charcoal from branches of wood up to 1′ in diameter lying prostrate under a cover of 3′–4′ of rhyolytic pumice from the last pumice explosion within Newberry Crater. Found at new road cut between Paulina and East Lakes, 2.5 mi west of East Lakes Forest Camp and approximately 1.5 mi southwest of the vent of the Big Pumice Cone between the lakes. The exact spot was 0.1 mi west of the turnoff to Paulina Lake Summer Homes and the same distance east of the turnoff to the IOOF Camp. Submitted by Howel Williams.	2054 ± 230
C-611, C-635, C-636, and C-640	*Danger* (*Lamus*) *Cave, Utah*: Samples from Danger Cave near Wendover, Utah. Floor of cave has beach sand 2′ thick from Lake Stansbury. This was dated at 11,453 ± 600 and 11,151 ± 570 by sheep dung and wood fragments, respectively, which were found in the sand (Samples 609 and 610). Submitted by Jesse D. Jennings, University of Utah.	
C-611	*Danger Cave III*: Charcoal from just above the sand in the lowest layers of the 15′ deposit of garbage and debris found at the cave mouth. Donor's sample No. F97FS515.	9789 ± 630
C-640	*Danger Cave VI*: Charred rat dung found on the sand. A thin layer of charred rat dung and ash was found at this level. Donor's sample No. FS619 (Feature 18 or 19).	8960 ± 340
C-635	*Danger Cave VII*: Charred bat guano, plant stems, and twigs from 18″–24″ below the current surface of the pile of debris. Donor's sample No. FS614 (Feature 17).	1930 ± 240
C-636	*Danger Cave VIII*: Charred bat guano, twigs, and plant fragments from 48″–52″ below the surface of the debris pile. Donor's sample No. FS615 (Feature 5).	3819 ± 160
	H. Minnesota, Wisconsin, and Wyoming	
C-630	*Kimberly, Wisconsin* (*Neenah*): Glacial wood from Kimberly, Wis. This consisted of a tree stump approx 9″ × 5″, found about 12 years ago in an excavation at the Kimberly-	10,676 ± 750

Our No.	Sample	Age (years)
	Clark Paper Mill by workmen of the Lampert Co., of Oshkosh. Mr. Lampert gave pieces of the wood to the Oshkosh Museum. The mill is almost in a direct line with the Pointe Beach site of Two Creeks, and it is thought that it should be of Mankato age (*cf.* Samples 308, 365, 366, 536, 537, 444 355, 356, and 337). James A. Lundsted, of the Oshkosh Public Museum, and Clifford Allen, of Kimberly-Clark, described the sample. W. F. Read, of the Department of Geology, Lawrence College, examined the site on May 2, 1952. He found that the wood occurred at a depth of about 10′ in a section of varved clays 25′ thick, which extends from the surface down to the limestone bedrock. He stated that the clay is "the youngest glacial deposit of the area" and "was almost certainly deposited in a temporarily ice-dammed lake formed against the front of the retreating Valders Ice (Lake Oshkosh)." According to Leland Horberg, of the University of Chicago, this strongly indicates that the wood is of Mankato age and that it was deposited as driftwood in the Lake Oshkosh clays. Submitted by James A. Lundsted.	
C-668	*Keyhole Reservoir, Wyoming* (*Keyhole Reservoir II*): Charcoal found in a small rock shelter (Site 48CK204) that occupies the sloping shelf of the south side of the sandstone bluff west of Mule Creek and south of the Belle Fourche River. The rock shelter is known as Excavation Unit 2 (XU2). The sample was composed of 7 small lumps of charcoal (Cat. Nos. 48CK204-120, -298, -327, -338, -430, -432, -462) and one lump of charred wood (Cat. No. 48CK204-429), taken from 4 basin-shaped, rock-filled hearths and from the sand matrix enveloping these hearths, and 4 similar hearths in squares N100E20 and L110E40 (XU2). A preliminary study of the data indicates that three components —two lithic and one ceramic ("Woodland") — are represented in XU2. Segregation of these components is difficult because the "floor" of the shelf is uneven, and the overlying	2790 ± 350

Our No.	Sample	Age (years)
	deposits of fine windblown sand have been subject to inflation as well as deflation, and have been profoundly disturbed by rodent action. Tentatively, two hearth levels representing the earlier and later lithic components have been recognized. The charcoal and charred wood comprising this sample came from hearths and matrices of the "earlier" level. Four "McKean lanceolate" fragments found below the level of these hearths and probably associated with them suggest that the earlier lithic components, XU2, may be contemporaneous with Level 1 in Site 48CK4 (Sample 667). Estimated age of the earlier lithic component, XU2, about 4000 years. Collected by Richard P. Wheeler and submitted by Paul L. Cooper, field director, River Basin Surveys, Lincoln, Neb.	
C-667	*Keyhole Reservoir, Wyoming* (*Keyhole Reservior I*): Charcoal from a small rock shelter on the north side of the Belle Fourche River, about ¼ mi east of the Keyhole Dam. Sample was obtained from the matrix of Level 1, which was the lowest occupational stratum and lay directly on bedrock. It consisted of three small lots of charcoal (Cat. Nos. 48CK4-81, -103, -111), which were taken from squares numbered N100E15, N100E20, N100E25. The number of the site is 48CK4. Together with the charcoal, fragments of small basally notched lanceolate points (the "McKean lanceolate" point) and other artifacts were found. These mostly resemble some material from Signal Butte IA. Collected by Richard P. Wheeler and submitted by Paul L. Cooper.	[1660 ± 250 1295 ± 400] Av 1478 ± 200 1813 ± 300 Grand Av 1646 ± 200
	J. Alaska	
C-696	*Uyak Bay, Kodiak Island, Alaska* (*Kodiak Island*): Wood from refuse midden excavated by A. Hrdlicka in 1935 on Uyak Bay, Kodiak Island. Came from the permafrost ground in the midden. Submitted by R. F. Heizer, University of California, Berkeley.	333 ± 280
	IV. *Mexico*	
C-687	*Tamaulipas, Mexico* (*La Perra*): Vegetable material	4445 ± 280

Our No.	Sample	Age (years)
	from Cave Tm.c.174. This is from the same site as Sample 207, which gave 651 ± 150 years, but this sample is well below the earlier charcoal sample. It was associated with artifacts of the Le Perra culture—the pre-pottery horizon—and should be uncontaminated culturally and physically. It was taken from 16″–22″ below the surface in Square N10W5 at Level 6 by R. S. MacNeish, National Museum, Ottawa, Canada. Submitted by Mr. MacNeish.	
V.	*South America*	
C-658	*Nazca Valley, Peru* (*Nazca Wool*): Dyed wool in the form of a turban bandeau. Taken from Grave 13, Cahuachi, Nazca Valley, Peru, by A. L. Kroeber. It was at Location A and in Section Aj (*cf.* sample No. 521). Submitted by D. Collier, Chicago Natural History Museum.	1679 ± 200
VII.	*Other Areas*	
C-660	*Lonze Forest, Barotseland, N. Rhodesia* (*Lonze Forest*): Charcoal from newly developed pit in the Lonze Forest, Barotseland, taken at the 5′ level (4′10″–5′3″). There was no evidence of tree roots, and it is believed the charcoal was free from root contamination. Collected by Desmond Clark, curator, Rhodes-Livingstone Museum, Livingstone, Northern Rhodesia. Submitted by H. L. Movius, Jr., Harvard University.	3585 ± 260
C-697	*Lonze Forest, Barotseland, N. Rhodesia* (*Kalahari*): Charcoal from depth of 12′ in the Kalahari Sand in a pit 8′ in diameter in the Lonze Forest. The sides of the pit were scraped at 12′ to expose the charcoal. It is not a continuous horizon. The charcoal was found in 7 places. Variation in depth between the lowest and highest samples did not exceed 8″. Collected by Desmond Clark. Submitted by H. L. Movius, Jr.	6098 ± 300
C-662	*Situmpa Forest, Machili, Northern Rhodesia* (*Situmpa Forest*): Charcoal from pits dug in the Situmpa Forest, taken at the 5′ level, which is tied with an archaeological locality that represents the first definitely dated archaeological horizon in this region. This should prove a clue as to the age of the Bantu penetration of Barotseland. Collected by Desmond Clark. Submitted by H. L. Movius, Jr.	4078 ± 300
C-663	*Chifubwa Stream Shelter, Solwezi, Northern Rhodesia* (*Rhodesian Nachikufan I*): Charcoal from Chifubwa Stream Shelter in Solwezi. From the lowest 18″ of an orange sand and the top 4″–6″ of a Late Stone Age occupation layer containing an industry known as Nachikufan I. The sample is of considerable importance for establishing the absolute chronology for prehistoric man in Southern Africa. Collected by Desmond Clark. Submitted by H. L. Movius, Jr.	6310 ± 250
C-613	*Zimbabwe, Southern Rhodesia:* (*Zimbabwe*): Large log from the famous prehistoric site of Zimbabwe in Southern Rhodesia. Zimbabwe is a rather elaborate town built by the ancestors of the modern Bantu peoples of South Africa. Generally thought to date from the fourteenth or fifteenth centuries A.D.; it may date as early as the ninth century A.D., however. It was to settle this controversy that this sample was submitted by H. L. Movius, Jr.	1415 ± 160 [1344 ± 160 1271 ± 260] Av 1361 ± 120
C-669	*Chalan Piao Site, Saipan Island* (*Saipan*): Oyster shell found 1.5′ below the surface at the Chalan Piao Site, about ½ mi inland from the shore line in the undisturbed, indurated sand beds that lie along the west coast of Saipan Island. Potsherds occurred at this level, and the deposition of the sherds and shell appears to have taken place previous to a 6′ eustatic fall in sea level. Guess date, based on Godwin's dating of this fall on the south English coast, is 3000–4000 years. The outer, slightly powdery surface of the shell was removed to leave a translucent interior. H. C. Urey measured the temperature of deposition to be 27.5° C by the oxygen 18 content, which is identical with present ocean temperatures in this area. Since the shell would have been washed by fresh water, alteration would have drastically	3479 ± 200

Our No.	Sample	Age (years)
	changed this apparent temperature by changing the oxygen 18 content. Dr. Urey therefore concludes that the oxygen had not been replaced in the shell. Consequently, we believe that the carbon has not been replaced, since each carbon atom is surrounded by oxygens in the carbonate ions. Submitted by Alexander Spoehr, Chicago Natural History Museum.	
C-721	*Blue Site, Tinian Island (Tinian Blue Site)*: Shell (*Tridacna*) from the Blue Site on Tinian in the Marianas Islands, from Test A at a depth of 1.9'. At this site a skeleton was found that exhibited yaws, according to T. Dale Stewart, of the U. S. National Museum. Yaws and syphilis probably are manifestations of related forms of spirochete. The Marianas skeleton, as bearing on the existence of yaws in the Pacific prior to the historic period, is thus relevant to the larger problem of the development and spread of both yaws and syphilis. In addition, the Blue Site is representative of the major prehistoric cultural manifestation, the *latte culture*, which persisted up to the sixteenth and seventeenth centuries. How far back it goes is not known. Dating the Blue Site should furnish evidence. The excavation was conducted under the direction of Alexander Spoehr as part of the Chicago Natural History Museum Expedition in 1949–50. Submitted by him for dating.	1098 ± 145

RADIOCARBON DATES—(*Continued*)

References

1. Arnold, J. R., and Libby, W. F. *Science*, **113**, 111 (1951).
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3. ———. *Radiocarbon Dating*. Chicago, Ill.: Univ. Chicago Press (1952).

News and Notes

American Congress on Surveying and Mapping

Official functioning of the Education Division for the first time since its creation last year featured the 12th annual meeting of the American Congress on Surveying and Mapping in Washington, D. C., June 11–13. The new division was formed in an effort to improve curricula in colleges and universities, which now offer few courses that are at all useful in training students to enter the increasingly specialized fields of surveying and mapping, where the study of such subjects as cartography, geography, geodesy, interpretation of aerial photographs, and other particularized subjects not found in civil engineering courses are required.

Education Division papers were read on such topics as the application of graphic arts to field and office surveying, U. S. Engineers' training of surveyors and mappers, surveying techniques, and a discussion of the three years of training required by the Virginia Department of Highways before it allows its new employes to supervise road projects.

The congress this year sponsored the most extensive exhibit of surveying and mapping equipment and reproduction devices ever held. Exhibitors were present not only from the United States, but also from Canada and several European countries.

A panel discussion on "Map Appreciation and Use" was highlighted in a paper read by Phil M. Miles, Kentucky State Agricultural and Industrial Development Board, who described his state's extensive cooperative mapping project with the aid of the U. S. Geological Survey. He added a note of humor by characterizing Kentucky as the only state that gives maps to visitors "so they can find their way to the Kentucky Derby between drinks."

Other speakers were Fowler W. Barker, of the Association of Professional Photogrammetrists; John W. Cain, of the U. S. Naval Photo Interpretation Center; Floyd Brinkley, of the U. S. Renegotiation Board; George C. Northrop, of the Joint Chiefs of Staff, Department of Defense; and Robert H. Lyddan, of the U. S. Geological Survey.

Maps containing false topographic information have been issued by some nations in the past, according to Col. Northrop, who added that the U. S. has found by experience that the economic advantages of giving correct data outweigh the military disadvantages. He cited several instances during World War II in which false maps very nearly resulted in tragedy for Allied troops that were trying to help the friendly nations that had provided the maps.

The great advantages and serious problems encountered in graduating the precise circle for use in

surveying and mapping were discussed by several speakers. Success in accomplishing this was described and illustrated by Benjamin L. Page, of the U. S. Bureau of Standards.

How local control aids the property surveyor was discussed by H. J. McFarlan, of the University of Michigan, and "Some Difficult Land Surveying Problems in the Florida Keys" was the interesting topic of a paper read by John P. Goggin, land surveyor of that state. The Canadian aspect was described by D. I. O'Gallagher, who told of the "Quebec *Procès-Verbal* of Boundary." The obvious advantages of local professional surveyors' organizations was the subject of a panel discussion.

"Charting Our Seas," by Robert W. Knox, U. S. Coast and Geodetic Survey, proved a feature topic of the Cartography Division. Hydrographic surveys are made primarily for issuing nautical charts, although they also serve as original public documents, and photographic copies often are furnished to other government agencies, private industry, and the general public, Admiral Knox explained, and he added that they are used for compiling bathymetric maps and for oceanographic and sedimentation studies. Industry uses them to study natural resources—particularly oil —and copies are employed in legal proceedings.

"Around the World in Eighty Days" was the subject of Newman Bumstead, National Geographic Society cartographer, who, unlike the hero of the Jules Verne story, spent most of his time sightseeing, because he flew around the world. Mr. Bumstead made the trip in the interest of the society's Map of the World. Humorous incidents marked his trip. He recalled the time in Egypt when he rode a camel named "Canada Dry," whose driver urged the animal on by cries of "Heigh-ho Silver"—the only English words he knew.

"Relief Mapping and the Bench Camera" were discussed by E. B. McCarthy, U. S. Coast and Geodetic Survey; and graduate training in cartography by J. Allen Hynek, assistant dean of Ohio State University's Graduate School.

A color-sound movie on *The Inter-American Highway through Central America and Panama* was shown through the courtesy of the U. S. Bureau of Public Roads.

The "Ninety Million Map" created by a relatively new agency, the U. S. Army Map Service, was the topic of a paper read by John G. Ladd, who traced the rapid but effective growth and the efficiency of his agency, established to meet the needs of World War II.

The new series of reconnaissance maps of Alaska, including a shaded-relief edition of most of the 153 quadrangles, was discussed by Gerald FitzGerald, U. S. Geological Survey, who related some of the fascinating history of this mapping project. He recalled the fact that only a few years ago this huge area was being mapped by surveyors using dogsleds, whereas almost all this work is now accomplished through aerial photography, and field men are transported by helicopter from one station to another, with great savings of time, money, and numbers of surveyors required.

"Maps of Nova Scotia" and the peculiar problems they presented were discussed by J. P. Messervey, deputy mines minister of that Canadian province. The importance of properly selecting contour intervals for topographic maps was described in detail by a panel that represented U. S. government leaders and mapping experts in private enterprises.

Control surveys as they relate to the ACSM Education and Property Surveys Divisions were discussed by Milton O. Schmidt, of the University of Illinois, and Sol. A. Bauer, a registered surveyor from Ohio. At the state level control surveys are extremely important, said C. A. Whitten, of the U. S. Coast and Geodetic Survey. "Shoran Operations in Canada" was the topic of a paper read by J. E. R. Ross, Dominion geodesist and International Boundary commissioner.

Some interesting aspects of geodetic observations in Mexico were related by Manuel Medina, director of the Mexican Office of Geodesy and Meteorology, who told of his encounters with Mexican rebels during a number of his field trips.

Delegates from many Latin-American countries and American members of the Congress on Surveying and Mapping were shown a color-sound motion picture, *Highways in the Sky*, describing the work of the U. S. Aeronautical Chart and Information Center, as well as a movie made by the Navy Hydrographic Office, and a training film of the U. S. Geological Survey. Delegates also inspected exhibits at a number of federal agencies that are actively engaged in surveying and mapping.

It is becoming increasingly difficult to obtain minerals from abroad, and the U. S. is not producing enough either for defense needs or for the expanding requirements of our peacetime economy, said Robert R. Rose, Jr., assistant secretary in the U. S. Department of the Interior. With living standards constantly rising and with increasing population, the problem is acute. Noting that requirements of metals for civilian and defense use are mushrooming at an alarming rate, Mr. Rose suggested that a possible answer may be found only if experts will quickly compile accurate information regarding the natural resources of the earth. Speaking on "Mineral Resources for Defense," Mr. Rose emphasized the need for more and more metals by pointing out that military aircraft alone during the recent world conflict required twice as much metal as did those of World War I. The increasing number of household appliances is an additional drain on metals resources, he declared.

J. VANCE DOBBIN

Topographic Division
U. S. Geological Survey

Scientists in the News

Homer L. Brinkly has been appointed to the Agricultural Research Policy Committee to replace **John H. Davis,** now general manager of the National Wool Marketing Corporation. Mr. Brinkly is executive vice president of the National Council of Farmer Cooperatives.

Harley E. Cluxton, Jr., of Lake Bluff, Ill., has been appointed director of the clinics at Northwestern University Medical School. Until last year he was director of medical research for the Armour Laboratories, Chicago, and served on the staff of the Mayo Clinic.

University of Wisconsin regents have accepted the resignation of **W. Windsor Cravens,** who has been associated with the Poultry Husbandry Department since 1937, first as an assistant and since 1941 as a faculty member. He has accepted a position in industry.

George Bernard Griffenhagen, of Los Angeles, has been appointed associate curator of the Division of Medicine and Public Health of the U. S. National Museum, Smithsonian Institution. He has been serving as assistant general manager and director of pharmaceutical research for the National Institute of Nutrition in Los Angeles, and as lecturer in pharmacy at the University of Southern California.

Henry W. Hemple, chief of the Division of Geodesy, U. S. Coast and Geodetic Survey, has retired from active duty after more than 35 years of service. For a major contribution to science, including the organization and development of steel-tower triangulation practice and leadership in the field of geodetic engineering in the U. S., Captain Hemple was awarded the 1952 Department of Commerce gold medal by the Secretary of Commerce.

At the Cleveland Health Museum's 12th anniversary civic luncheon at the Hotel Carter, **W. W. Peter** received the Elisabeth S. Prentiss National Award in Health Education. Dr. Peter is professional training branch chief in the Division of Health, Welfare and Housing, Institute of Inter-American Affairs, Washington, D. C. As director of the Council on Health Education, Dr. Peter helped the Chinese conquer the Foochow cholera epidemic in 1919. During 1934–42 he was director of the U. S. Navajo Service, organizing the Navajos in their fight against tuberculosis. He was associate professor of public health in the School of Medicine, Yale University, for three years before joining the Institute of Inter-American Affairs in 1945.

Lorne D. Proctor has been appointed physician-in-charge of the Division of Neurology and Psychiatry at the Henry Ford Hospital, succeeding **Thomas J. Heldt,** who retired July 1. Dr. Proctor was for many years associated with the University of Toronto both in the Department of Psychiatry and in the Department of Medical Research. He had also organized and directed a very active service in neurology and psychiatry as attending staff physician at the Toronto Western Hospital.

Myron J. Rockmore has been appointed to serve on the staff conducting a study of the release of mental patients for the New York State Mental Hygiene Council. The study was undertaken recently at the request of Governor Thomas E. Dewey. Mr. Rockmore will assist **Daniel Blain,** medical director of the American Psychiatric Association, who is serving as psychiatrist-in-charge, in making an analysis of administrative practices and procedures relating to the release of mental patients.

Education

An Industrial Engineering Institute will be held on the **University of California's** Berkeley campus Jan. 30–31 and on the Los Angeles campus Feb. 2–3. The institute, sponsored by the American Institute of Industrial Engineers, the American Society of Mechanical Engineers, the Society for Advancement of Management, the Society of Applied Industrial Engineers, and the American Society for Quality Control, has met annually for the past five years to discuss fundamentals and current practical applications in the field of industrial engineering and management. Speakers will include L. D. Miles, M. R. Lohman, George H. Gustat, Lillian M. Gilbreth, Ellis A. Johnson, and Dwayne Orton.

The **University of Chicago** has appointed S. Chandrasekhar the Morton D. Hull distinguished service professor of theoretical astrophysics; Richard P. McKeon the Charles F. Grey distinguished service professor of philosophy; and Harold C. Urey the Martin A. Ryerson distinguished service professor of chemistry.

Harvard University has appointed John H. Curtiss, of the Institute of Numerical Analysis of the National Bureau of Standards, visiting lecturer in the Division of Applied Science for the spring term. Andre Guinier, of the Sorbonne, internationally known for his work in x-ray and metallurgy, has also been named visiting professor in the division.

Indiana University Medical School, Department of Physiology, will hold its fifth course of George Cyril Graves lectures Jan. 13–15. Eugene M. Landis, George Higginson professor of physiology, Harvard Medical School, will be the speaker.

Mount Holyoke College has established Industrial Associates for Women in Science, the membership of which will include industrialists, scientists, and representatives of the college. The associates will seek to develop projects in education, teaching, and research to which industry may contribute both as a public service and in its own interest, and which will advance the educational aims of Mount Holyoke.

In the Laboratories

Beckman Instruments, Inc., has appointed Taylor Fletcher manager of its Special Products Division, succeeding John F. Bishop, who has been made assistant general manager, Instruments Division. Mr. Fletcher was formerly with General Electric and Jet Propulsion Labs; Mr. Bishop, prior to joining Beckman, was with the Bureau of Ships and Owens-Corning Fiberglas Corporation.

The following scientists have been added to the **Los Alamos Scientific Laboratory** staff: C. G. Chezem, R. L. Cubitt, P. J. Leurgans, L. R. Stein, and E. A. Voorhees, Jr. (physics); Helen L. Smith (chemistry); J. E. Hockett and E. G. Zukas (metallurgy); and R. M. Kloepper (electrical engineering). W. A. Biggers, physicist, has rejoined the staff.

The **National Bureau of Standards** has begun the construction of a $4,500,000 building to house its Central Radio Propagation Laboratory. Located near the campus of the University of Colorado, the building is expected to be completed early in 1954. The laboratory is engaged in ionospheric and systems research and work on measurement standards and provides advice on radio subjects for other agencies of the government.

Meetings and Elections

The **American Association of Physics Teachers** will hold its annual meeting at Harvard University, jointly with the American Physical Society, Jan. 22–24. Paul E. Klopsteg, of the National Science Foundation, and AAAS Executive Committee member, is president-elect of the association.

The **American Chemical Society** has chosen Harry L. Fisher, special assistant to the director of the Office of Synthetic Rubber, RFC, president-elect. Farrington Daniels, head of the Department of Chemistry, University of Wisconsin, will take office as president on Jan. 1, succeeding Edgar C. Britton, of Dow Chemical Company. Raymond E. Kirk and Ernest H. Volwiler were named to the society's Board of Directors for three-year terms.

The **Arctic Institute of North America** has elected Edward H. Smith (USCG, ret.) chairman of the Board of Governors for 1953. For the past three years, Admiral Smith has served as governor and vice-chairman of the institute, the only organization in North America devoted exclusively to scientific research in the Arctic. Three new members were elected to the Board of Governors: Richard F. Flint, Robert F. Leggett, and Hugh M. Raup.

The second **International Congress on Rheology** will be held July 26–31 in Oxford, England. Geoffrey Taylor is president of the congress, and G. W. Scott Blair, The University, Reading, England, is organizing secretary.

Miscellaneous

The following engineering educators have joined **Du Pont's** Year-In-Industry program, now beginning its second year: T. Stephen Crawford, of the University of Rhode Island; Jesse W. Mason, of Georgia Institute of Technology; and James H. Potter, of the University of Illinois. On leave of absence from their respective college posts, the educators will spend 12 months going through the company's entire engineering organization, with their regular salaries and normal expenses borne by Du Pont.

Participants in the **Mount Desert Island Biological Laboratory** Tissue Culture program included Betty Danes, Margaret H. D. Smith, John Torrey, and Frederick Wolfgram, with Barbara Holmes as assistant to Dr. Smith. The laboratory work was supplemented by group conferences and a series of six lectures by Philip R. White. The program will be continued next year. Applications should be sent to Dr. White, Roscoe B. Jackson Memorial Laboratory, Bar Harbor, Me., before *Mar. 15*.

The **National Science Foundation** has appointed the following advisory panel to study problems in minerals research connected with the recommendations of the President's Materials Policy Commission: John G. Bartram, Alan Bateman, James Boyd, Arthur H. Bunker, Paul D. Foote, L. C. Graton, John Gustafson, Thomas Nolan, Louis Slichter, John Vanderwilt, Clyde E. Williams, Donald H. McLaughlin, Andrey A. Potter, Earl P. Stevenson, and Paul E. Klopsteg. Also attending the first meeting, held Nov. 29, were Allen V. Astin, Paul Zinner, and E. D. Gardner.

Chemicals wanted by the **Registry of Rare Chemicals**, 35 W. 33rd St., Chicago 16, Ill., include: niobium pentafluoride; gallium trichloride; silicon sulfide; molybdenum oxydichloride; silicon tetrabromide; 3-aminothianaphthene; 1,1,1-trifluoro-2-methylpropanol-2; benzofuran; benzoyl disulfide; pyrimidine; α,α-diphenyl-β-methyl fulgide; divinyl ether; 7-hydroxy-2-naphthoic acid; N-methyl pyrrolidone; xanthotoxin; benzoyl-L-(+)-alanine; D-thyroxin; benzoyl-L-argininamide; norepinephrine; and amoidin.

National Institutes of Health point out that it is **Roger W. Sperry**, and not Robert W. (SCIENCE, **116**, 627 [1952]), who is the new chief of the section on Developmental Neurology in the Laboratory of Anatomical Sciences.

It is with deep regret that the officers and staff of the Association have learned of the death of F. R. Moulton, administrative secretary of the AAAS from 1937 to 1949. Since his retirement from office in January 1949, he has lived quietly in Evanston, and he died Dec. 7 in Wilmette, Ill., at the age of 80. A memorial service is planned, but the time and place have not yet been announced.

Technical Papers

The Effect of Environmental Temperature on Cortisone Toxicity for Mice[1]

George H. Scherr

Department of Microbiology, The Creighton University School of Medicine, Omaha, Nebraska

In the course of a study now being conducted on the effect of cortisone and other compounds on mice systemically infected with *Candida albicans*, it became apparent that the mortality rates of control animals varied with the season of the year. It was therefore felt pertinent to ascertain what effect different environmental temperatures had on infected mice and on uninfected, treated controls; this report concerns itself with the latter.

Groups of 10 Swiss mice (departmental stock), 18–22 g, were placed at incubation temperatures of 35° to 37° C, 25° to 29° C, and −5° to 7° C. Half of these animals were inoculated intramuscularly with 0.5 mg (0.1 ml) of cortisone acetate (Merck)[2] every 48 hr for 8 days, initiating this treatment on the first day. Untreated animals were maintained as controls. Table 1 records the numbers of survivors in all groups of mice studied.

TABLE 1

SURVIVAL OF MICE INOCULATED WITH 0.5 MG OF CORTISONE ACETATE EVERY 48 HR AND INCUBATED AT VARIOUS TEMPERATURES

Temp (°C)	Sex	No. surviving								
		1	2	3	4	5	6	7	8	Days
35°–37°	M	10	10	10	8	7	7	5	3	
25°–29°	M	10	10	10	9	6	6	6	6	
−5°– 7°	M	10	10	10	10	10	10	10	10	
35°–37°	F	10	10	10	9	9	9	8	7	
25°–29°	F	10	10	10	10	9	9	9	9	
−5°– 7°	F	10	10	10	10	10	10	10	10	
Controls, untreated										
35°–37°	M	10	10	10	10	10	10	10	10	
25°–29°	M	10	10	10	10	10	10	10	10	
−5°– 7°	M	10	10	0	0	0	0	0	0	
35°–37°	F	10	10	10	10	10	10	10	10	
25°–29°	F	10	10	10	10	10	10	10	10	
−5°– 7°	F	10	10	0	0	0	0	0	0	

From these data one may infer the following:

1. The toxic effects of cortisone were enhanced by an increased environmental temperature (35° to 37° C).

2. This enhanced toxicity was more manifest in male mice. This was evident at the 35° to 37° C and 25° to 29° C temperature ranges. This effect was also reported by Ingle (*1*) for male and female rats inoculated with "cortin."

3. A cold temperature (−5° to 7° C) eliminated the toxic effects of the cortisone manifest at higher environmental temperatures.

4. This dosage of cortisone eliminated the deleterious effects of the cold. Thus, all treated mice, male and female, survived the 8-day incubation period, whereas all the controls were dead by the second day.

This work was repeated with essentially the same results.

These experiments lack the refinement of humidity control and maintenance of a constant oxygen tension in the incubators, which may be significant in modifying the mortality rates of the mice. The work should be repeated by those having access to temperature- and humidity-controlled cabinets that are also air-circulated.

Numerous workers who have been studying the effects of cortisone on infected animals determine the toxic levels for cortisone for a certain schedule and use this standard for all future experiments without repeating this control portion of the work. It is our contention that controls of uninfected, treated groups of animals are required for *each* experiment. The alternative is to perform such experiments under conditions where temperature, humidity, and air circulation can be controlled.

It is also conceivable that these temperature effects might be significant in the clinical use of cortisone. It is not known to this author that such applications have been made.

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[1] This report is part of a study supported by contract NONR-717(01) between the Office of Naval Research, Department of the Navy, and the Creighton University School of Medicine.

[2] The generosity of Merck & Co. in supplying cortisone acetate is gratefully acknowledged.

Adsorption of Serum Lipids by Montmorillonite

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The fact that soils high in clay retain much greater amounts of organic matter than those low in clay has led to several investigations dealing with the adsorption capacity of clays. Among them montmorillonite is very effective because of its high ion exchange and swelling capacities. Thus montmorillonite adsorbs large protein molecules, such as albumin, gelatin, hemoglobin

[1] This investigation was aided by a grant from Sigrid Juselius Stiftelse. The authors are fellows of the Finnish State Scholarship for Young Scientists.

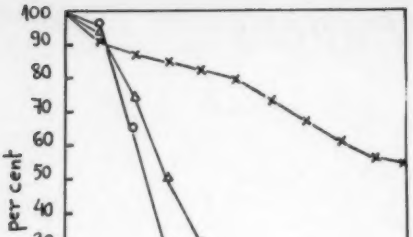

FIG. 1. The effect of montmorillonite on serum protein (x—x), total cholesterol (○—○), and phospholipids (△—△). Mean values from 7 sera. Abscissa: mg bentonite/ml serum. Ordinate: percentage of control sample.

(*1, 2*), and humic colloids of soil (*3*). The adsorption mechanism has been discussed by several authors (*1–5*). Because the adsorption of organic colloids in montmorillonite is most effective at low pH, it is possible that a reaction takes place between the basic groups of the proteins and the negative charges on the clay (*2, 6*). Montmorillonite combined with proteins has a much smaller base exchange capacity than uncombined montmorillonite, which shows that a blockage of exchangeable groups must occur. The properties of the proteins combined with this clay mineral are also altered. This is shown by the high resistance of the protein-montmorillonite complex to hydrolysis by proteolytic enzymes (*7*), and to decomposition by soil microorganisms (*8*), as well as by the lowering of the isoelectric point of the protein after the addition of bentonite (*9*).

The adsorption capacity of montmorillonite has been used by Hansen (*10*) for the removal of antiproteolytic serum factors, especially lipoproteins—e.g., diphtheria antitoxin purification. According to him montmorillonite added to diluted serum removes cholesterol and lipids, besides remnants of fibrin and euglobulin, without any appreciable change in the antitoxin content of the serum. Serum lipids also seem to be responsible for the nonspecific antistreptolysin-O reactions (*11*), and for this reason an attempt to remove these serum lipids with montmorillonite was made (*12*). These experiments have confirmed the statements made by Hansen, and the data presented here show the effect of montmorillonite on the content of cholesterol, phospholipids, and proteins of normal human serum.

Montmorillonite suspensions of varying concentrations were made in distilled water and added to normal human serum diluted with equal parts of physiological saline. The mixture was shaken gently and allowed to stand for half an hour at room temperature and then centrifuged at 2500 rpm. The clear supernatant fluid was then analyzed for total cholesterol, phospholipids, and proteins. The results so obtained are presented in Fig. 1. The diagram shows that, when used in small concentrations and at a slightly alkaline pH (about 8.0), montmorillonite adsorbs all the cholesterol, 80–85% of the phospholipids, and 15–20% of the proteins. Electrophoretic analyses of the bentonite-treated sera showed that the greatest changes occurred in the β-globulin fraction of the serum, for this was reduced to about 20%, when 20 mg of montmorillonite/ml of serum were used.

According to Blix *et al.* (*13, 14*), among others, the serum lipids are supposed to occur mainly in the β-globulin fraction of the serum. When calculating the amount of lipids and proteins adsorbed in this experiment, it thus seems likely that the component(s) which are adsorbed represent a lipoprotein containing about 25% lipid material, and accordingly the part (15–20%) of the phospholipids that is not adsorbed by montmorillonite is not combined as lipoprotein. It is difficult to say, however, to what extent the protein moiety of this montmorillonite-adsorbable lipoprotein complex functions as a lipid carrier also in untreated serum. This question has been to some extent elucidated by the recent investigations of Turner *et al.* (*15*). According to their ultracentrifugal studies on native serum, 70% of the serum lipids and about 20% of the proteins were found in the upper half of the ultracentrifugate column. In this connection it may also be worth mentioning that extraction of the serum lipids with acetone and ether in the cold does not remove all the phospholipids (*14*). Thus, independent of the separation method used, a fraction of the serum lipids containing, for example, the total cholesterol, can apparently be easily separated, whereas another fraction, containing a part of the phospholipids, seems to be very difficult to separate from the serum.

On the basis of the findings presented here, it is our opinion that montmorillonite could be used for the removal of lipid-containing material from different sources, as well as for investigations concerned with the interactions between lipids and proteins.

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Improved Infrared Photography for Electrophoresis[1]

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The use of infrared light and infrared-sensitive plates for photographing pigmented protein solutions in electrophoretic work was first proposed by Treffers and Moore (*1*). A Nernst lamp or an ordinary tungsten lamp was suggested as a source of infrared light, but further specifications for the lamps or plates were not given. Examples of infrared photographs obtained by Moore for electrophoretic patterns of hemolyzed sera were presented by Abramson, Moyer, and Gorin (*2*). Longsworth (*3*) described interchangeable mountings for infrared lamps and the usual mercury vapor lamps. Recently, Kegeles and Gutter (*4*) showed that, with the aid of red-sensitive Eastman Kodak Spectroscopic Type 103-F plates, and a Wratten No. 105 filter for isolating the red lines of the mercury vapor lamp, satisfactory photographs of hemolyzed sera could be obtained without recourse to special sources of red light.

For electrophoretic studies on tissue extracts (*5*), we have found it necessary to use quite strong infrared illumination, since the protein solutions that we have been required to examine are often not only pigmented but also quite opalescent. It was not to be expected that the infrared radiation produced by the mercury vapor lamp would be generally adequate for this purpose. Tungsten projection lamps of the coiled filament type supplied strong enough infrared light but, because of the spaces between the coils, did not produce an even illumination of the entrance slit, a factor of importance when the Svensson-Philpot lens system is used.

The above problem was solved through the use of a tungsten projection lamp of the ribbon filament type. Such a lamp, having specifications suitable for electrophoretic work, is now available,[2] and is illustrated in Fig. 1. The filament is 2 mm wide, with an effective length of about 35 mm. Near one end of the filament is an expansion notch designed to keep the ribbon taut when it is heated. The rating is 7.5 v at 30 amp; a voltage transformer[3] is therefore required as an accessory. The lamp is fitted with a mogul prefocus base, is mounted in a horizontal position very close to the entrance slit, and is cooled with a blower. The bulb is turned so as to locate the filament support below

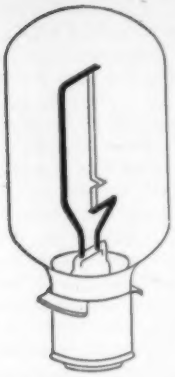

FIG. 1. General Electric ribbon filament lamp.

the filament. By the use of a mounting similar to the one used for the mercury vapor lamp, the two lamps are readily interchanged. Because of its limited life, the ribbon filament lamp is operated only when necessary.

For determining the efficacy of the ribbon filament lamp, a solution of hemoglobin and an extract of tumor (*5*) were used as test materials. These were placed in the electrophoresis cell in the usual way, and the boundaries that were formed were brought into view with the aid of a compensator. The boundaries were then allowed to diffuse to a desired degree before photographs were taken. In conjunction with the ribbon filament lamp, Eastman Kodak Spectroscopic Type I-N plates and a Wratten No. 25 filter were used. From the results, shown in Fig. 2 *a*, it may be seen that contrast across the hemoglobin boundary was completely eliminated, whereas that across the boundary of the tumor extract was only moderate.

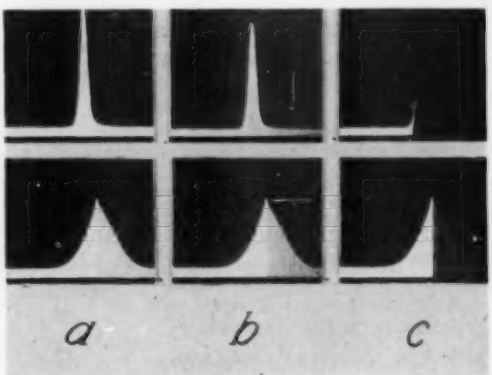

FIG. 2. Svensson-Philpot diagrams obtained with different light sources, photographic plates, and filters. Top row, pigmented hemoglobin solution. Bottom row, opalescent tumor extract. (*a*) Ribbon filament lamp, Type I-N plates, No. 25 filter, 2 sec exposure; (*b*) mercury vapor lamp, Type 103-F plates, No. 25 filter; 40 sec exposure for hemoglobin, 120 sec exposure for tumor extract; (*c*) mercury vapor lamp, Type IV-G plates, No. 77 filter, 10 sec exposure.

[1] This work was supported in part by a research grant from the National Cancer Institute, of the National Institutes of Health, USPHS, and in part by an institutional grant from the American Cancer Society.

[2] G-E projection lamp, Code No. 30A/T20/4. We wish to acknowledge the cooperation of R. E. Farnham, of the General Electric Company, Cleveland, Ohio, in directing our attention to this lamp. The diagram in Fig. 1 is reproduced with the permission of the General Electric Company.

[3] A suitable transformer may be obtained from Air Design, Inc., 241 Fairfield Ave., Upper Darby, Pa.

To compare the above results with those obtained under the conditions specified by Kegeles and Gutter, photographs were also taken with the mercury vapor lamp, Type 103-F plates, and the No. 25 filter. The No. 25 filter was, for the present purpose, equivalent to the No. 105 filter used by Kegeles and Gutter. The results obtained in these tests (Fig. 2 *b*) are quite comparable to those of Fig. 2 *a* except that the exposure required with the mercury vapor lamp was about 60 times as long. For photographing test samples which are more pigmented or more opalescent than those used here, the length of exposure needed with the mercury vapor lamp may become prohibitive.

In further tests, in which direct comparisons of the I-N and 103-F plates were made, it was found that the two types of plates were practically interchangeable, either with the ribbon filament lamp or with the mercury vapor lamp. The I-N plates possessed three significant advantages, however, in that they showed clearer backgrounds, sharper images, and less halation when overexposed.

Finally, to compare the results obtained with infrared light with those obtained with green light, photographs were taken with the mercury vapor lamp, Type IV-G plates, and a No. 77 filter. It is clearly apparent from Fig. 2 *c* that with the green light a high contrast across the boundaries and an incomplete recording of the images resulted.

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On the Evaluation of the Constants V_m and K_M in Enzyme Reactions

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Hofstee (*1*), discussing the evaluation of the constants, V_m and K_M, of the Michaelis-Menten equation, points out some disadvantages of the form of this equation proposed by Lineweaver and Burk (*2*). Hofstee's preferred equation (III) is identical, except for transposition of terms, with the form suggested by me in 1942 (*3*), namely:

$$v = V_m - K_M(v/s).$$

(I use Hofstee's symbols.) This form has the additional advantage in being that usually adopted for the regression equation. Statistical methods can then be readily applied to the evaluation of these constants, a matter of considerable difficulty with the equation of Lineweaver and Burk.

This formulation can also be used in the analysis of inhibition, the effects of which may be summarized as follows, using the classification of Ebersole, Guttentag, and Wilson (*4*), and putting $q = \left(1 + \frac{(I)}{Ki}\right)$

Type of inhibition	Slope	Intercept
II (competitive)	$q.K_M$	V_m
III (noncompetitive)	K_M	V_m/q
IV (uncompetitive)	K_M/q	V_m/q

Here the slope alone is sufficient to characterize the inhibition insofar as it is increased, unchanged, or decreased. This is not the case with plots of the type of Lineweaver and Burk, where the slope is unchanged in both Type III and Type IV. The error of the intercept is the error of the slope magnified by extrapolation and is therefore always greater. It is thus obviously advantageous to base conclusions on the slope, rather than on the intercept.

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Root Illumination and Flowering

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The reception of the photoperiodic stimulus which induces or promotes the flowering of plants appears to be localized chiefly in leaves, although there is some evidence that both aerial stems and rhizomes may participate in this reception (*1, 2*). Similarly, the reception of photoperiods which inhibit or retard flowering appears to occur principally in leaves. The absence of information concerning possible involvement of roots in such phenomena led the authors to perform an experiment on the effects of root illumination upon floral initiation and inflorescence growth.

Plants of *Amaranthus caudatus* L., a short-day species (*3*), were grown in greenhouse soil to the age of 6 weeks under long photoperiods to maintain them in vegetative condition and, after thorough root washing, were transplanted to especially constructed, trough-shaped boxes (Fig. 1) in such fashion that the root systems of the plants developed in a plane between the glass wall of the box and a sheet of finely woven glass fabric. Each trough was filled with a mixture of Vermiculite (two thirds) and peat moss (one third), and the mixture was watered daily throughout the experimental period with a complete three-salt nutrient solution with added micronutrients. The boxes were constructed in such fashion that opaque slides could be inserted against the glass sides; through manipulation of the slides it was possible to

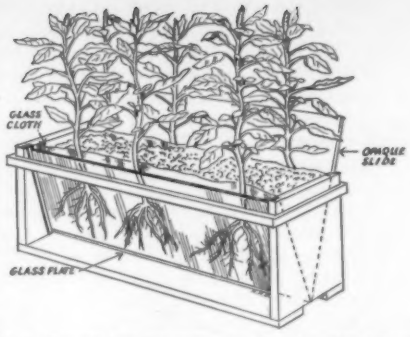

FIG. 1. Growth box for exposure of root systems to photoperiods.

expose root systems to differing photoperiods. Light-proof hoods, constructed to rest on the tops of the boxes, were used to control the photoperiods received by the tops. After transplanting, the plants in the culture boxes were exposed to long photoperiods for 6 days, a period sufficient to permit recovery from the transplanting procedure. The troughs were then divided into three experimental sets:

Set I—Tops exposed to daylight from 8: 30 A. M. until 4: 45 P. M.
—Roots exposed to daylight from 8: 30 A. M. until 4: 45 P. M.

Set II—Tops exposed to daylight from 8: 30 A. M. until 4: 45 P. M.
—Roots exposed to daylight from sunrise until sunset (from 13 to 14½ hours of daylight during the experiments), plus artificial light from 2 horizontal 47-in. fluorescent tubes (40 w) at a distance of 2 ft, from sunset until 11 P. M.

Set III—Tops exposed to daylight from 8: 30 A. M. until 4: 45 P. M.
—Roots received no light (i.e., opaque slides over glass sides not removed).

Observations were made during a period of 16 days upon inflorescence initiation and rate of inflorescence growth. The results with relation to inflorescence initiation are presented in Table 1.

TABLE 1

Days of exposure	Nos. of plants with inflorescences (inf) and without inflorescences (veg)		
	Set I	Set II	Set III
6	3 Inf, 9 Veg	1 Inf, 11 Veg	6 Inf, 6 Veg
8	9 " 3 "	5 " 7 "	12 " 0 "
10	12 " 0 "	9 " 3 "	12 " 0 "
12	12 " 0 "	12 " 0 "	12 " 0 "

Measurements made on the rate of inflorescence growth in the three sets are presented in Table 2.

The results of this experiment and of similar experiments indicate that exposure of roots to photoperiods retards both the initiation and growth rates of inflorescences of *A. caudatus* L., as compared with the initiation and growth rate of inflorescences of plants the roots of which receive no light. Since there were no apparent differences in the degree of development of roots and stems in the three sets of plants, it may be concluded that this effect of light is a direct effect upon the initiation of inflorescences and not an indirect effect in retarding growth of the plants. Both short and long illumination of roots results in delayed initiation of inflorescences and in their subsequent growth; the longer exposure of roots to light resulted in greater retardation of inflorescence formation and inflorescence growth, as compared with the effects of the shorter exposure of roots to light.

TABLE 2

Days of exposure	Av lengths of inflorescences (mm)		
	Set I	Set II	Set III
8	8.1	7.2	9.5
10	11.1	9.3	15.8
12	16.2	11.5	24.5
14	26.0	20.6	35.0
16	39.6	30.9	58.1

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Manuscript received June 13, 1952.

The Radioactivity of the Hot Springs at Tiberias[1]

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In a previous communication the results of an investigation based on the counting of alpha tracks and stars in nuclear emulsions exposed to water from the spa at Tiberias were reported (*1*). The investigation has been extended by making use of an alpha methane –flow proportional counter. This has facilitated the identification of the isotope responsible for the major portion of the activity, as well as a measurement of its concentration. Several methods of preparing samples were tried; the following procedure has been found most satisfactory. A glass bottle is washed thoroughly with spring water, filled completely and sealed with a ground-glass stopper while beneath the surface of the spring. Five ml water from the bottle is evaporated on a sample pan. No more than 20 min should elapse between opening the bottle and inserting the dry sample pan into the counter.

[1] Research supported by F. Julius Fohs Foundation. It was carried out under the direction of F. Ollendorff, who suggested the topic. Thanks are due to A. Tcherniavsky for extending the facilities of his laboratory and for his helpful advice.

[2] Present address: Physics Department, Brookhaven National Laboratory.

All samples of Tiberias water examined in this fashion yielded a large initial net alpha counting rate, which decayed within a few hours to levels close to background. The half-life obtained from a weighted mean of observations of 21 different samples was 36.8 ± 2 min.

It is well known that the "active deposit" of radon yields an alpha emission with a half-life of this order. The theoretical half-life of the "deposit" may be calculated from the known disintegration constants of Ra A, Ra B, and Ra C, but the result depends upon the relative initial quantities of these substances present in the sample pan at the moment it is introduced into the counter. Adopting reasonable values for these relative quantities, the theoretical half-life of the deposit may be shown to be 38.3 min, in good agreement with the experimental value quoted above. Hence, dissolved radon must account for the major portion of the radioactivity of Tiberias Hot Springs.

The concentration of radon in the water may be estimated on the basis of the initial net counting rates of the samples if corrections are made for: (*a*) the decay of the radon during the interval between bottling and preparation of the sample, (*b*) decay of the active deposit during the time (10 or 15 min) required to determine the "initial" count, and (*c*) self-absorption of the alpha particles in the sample. The modes of application of the first two corrections are obvious; the third correction is effected by means of the Bragg-Kleeman rule, as described by Evans and Goodman (*2*).

In the case of the strongest of the 21 samples examined, the initial alpha counting rate was 13.8/min, which, allowing for the background of 0.2/min, reduces to 13.6 net cpm. After application of the above three corrections this was found to correspond to a concentration of 2.18×10^{-11} curies/ml water from Tiberias Hot Springs. Most of the samples yielded an activity corresponding to at least one third this value; a few were as weak as one fifth.

A number of cold springs in the neighborhood of Tiberias were tested by the same method. The chief radioactive ingredient was again found to be radon, but the concentration was lower, ranging between 10^{-12} and 3×10^{-12} curies/ml water.

Tiberias Hot Springs were examined for traces of long half-life activity by means of aged samples of salts (obtained by evaporation of the water), which were introduced into the counter. In some cases no activity above background was detectable, even when very long counting times were resorted to; in others the net counting rate, corrected for absorption of the alpha particles within the sample, corresponded to as much as 10^{-12} curies of long half-life alpha activity/ml spring water. Apparently, some long half-life alpha emitter is present in Tiberias Hot Springs but, being a solid, it is naturally far less uniformly distributed than the radon. The average long half-life activity was found to correspond to as little as 10^{-13} curies/ml water. (This explains the results obtained by emulsions, referred to in the first paragraph.)

An attempt was made to identify the element responsible for the long half-life alpha emission by studying a few of the more active samples. Measurements of the range in aluminum of the alpha particles were carried out, but were necessarily inconclusive, owing to the very low activity and unavoidable thickness of the sources. They sufficed only to rule out elements such as uranium, with a very low energy spectrum.

Theoretically, the springs must contain some Ra D. The concentration of this long-lived isotope depends upon the length of time a specified concentration of radon is maintained, through an underground supply, in a given milliliter of water. This, in turn, depends upon unknown data, such as the manner in which the radon is picked up and circulated in the springs. Ra E and Ra F will, of course, be present in equilibrium with the quantity of Ra D. Thus, it is possible that all or part of the long half-life activity observed in aged Tiberias salts is due to the alpha emitter Ra F, maintained at a constant level by the decay of the 22-year half-life Ra D. Some experimental evidence supporting this theory was obtained, but was not entirely conclusive.

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An Action of ACTH on Adrenal Slices[1]

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The studies presented in this communication demonstrate, by two separate methods, a stimulatory effect of added ACTH on corticosteroid hormone production by adrenal cortical slices under conventional incubation conditions. Since the completion of this work Saffran, Grad, and Bayliss (*1*) have reported that the addition of ACTH to rat adrenal halves *in vitro* results in an increased output of adrenal cortical hormones as measured by the ultraviolet absorption of extractable lipid material and by biological assay.

The procedure followed in this study was, with slight variations, as follows: Fresh beef or pork adrenals were sliced freehand or with a Stadie-Riggs microtome. The slices were divided into two groups and placed in citrated whole beef blood containing sodium acetate-1-C^{14}. To one group was added ACTH (approx 6 μg of an Astwood preparation per g tissue every 15 min); the other group served as a control. The incubations were for 2 hr at 37° C in an atmosphere of 95% O_2 and 5% CO_2. After incubation the slices and blood were extracted with 70% aqueous

[1] This work was supported in part by Contract No. DA-49-007-170-184, Department of the Army.

TABLE 1

INFLUENCE OF ACTH ON *in Vitro* INCORPORATION OF ACETATE-1-C^{14} INTO 17-HYDROXYCORTICOSTERONE

Acetate (μc/g gland tissue)	Compound F (17-hydroxycorticosterone)			
	Control		Added ACTH	
	Amount carrier F added (mg)	Specific radioactivity of isolated F (cpm/mg)	Amount carrier F added (mg)	Specific radioactivity of isolated F (cpm/mg)
13.5 (Hog)	0.5	46	0.5	92
83 (Cow)	2.0	102,000	2.0	200,000
94 (Bull)	2.15	3,370	2.15	7,350

ethanol, the extract was washed with ligroin, and the alcohol removed by distillation *in vacuo*. The remaining aqueous solution was extracted with methylene chloride, and the resulting extract was fractionated by chromatography on a column of silica gel. To each of the resulting corticosteroid fractions, a calculated weight of crystalline 17-hydroxycorticosterone (Table 1) was added as carrier. The diluted fractions were then chromatographed on filter paper strips in toluene-propylene glycol (*2*). The 17-hydroxycorticosterone zones were located, cut from the paper, eluted, and the specific radioactivity was determined (Table 1). Areas adjacent to the steroid zones were also eluted and were found to contain insignificant amounts of radioactivity. Characterization of the radioactive 17-hydroxycorticosterone eluted from the paper chromatograms was achieved by repeated chromatography on paper without decrease in specific radioactivity and by oxidation to adrenosterone. This oxidation of the 17-hydroxycorticosterone was carried out with chromic acid and gave rise to a ketosteroid which migrated on a paper chromatogram (ligroin-propylene-glycol system) as adrenosterone. The specific radioactivity of this steroid was of the same order as that of the 17-hydroxycorticosterone from which it was derived. The results of these experiments show that incorporation of C^{14} into 17-hydroxycorticosterone was increased twofold in the presence of ACTH.

Experiments were also done which demonstrated that added ACTH increased the output of formaldehydogenic steroids from adrenal slices. Corticoid extracts were chromatographed on silica gel, and the amounts of corticoids present were estimated by periodate oxidation of the appropriate column fractions, followed by determination of the liberated formaldehyde. Data from one such experiment given in Table 2 show that incubation with ACTH substantially increased the output of formaldehydogenic steroid by the slices. Liver slices, incubated and analyzed in the same fashion as the adrenal slices, showed no formaldehydogenic steroids before or after incubation.

TABLE 2

INFLUENCE OF ACTH ON *in Vitro* OUTPUT OF FORMALDEHYDOGENIC SUBSTANCES
(Values in μg formaldehydogenic steroid per g tissue)

Steroid initially present	Steroid at end of incubation						Output			
	Control			ACTH			Control		ACTH	
	No. vessels	Av	Range	No. vessels	Av	Range	Av	Range	Av	Range
44	4	71	62–78	4	126	107–148	27	18–34	82	63–104

In summary, the data indicated that the output of corticosteroids by adrenal cortex slices was substantially enhanced by the action of ACTH. The fact that ACTH stimulated the incorporation of C^{14} from acetate-1-C^{14} into 17-hydroxycorticosterone agrees with the finding of Hechter *et al.* (*3*) in perfused adrenals that ACTH accelerates the synthesis of corticosteroid hormones and not merely increases the rate of their release from the gland.

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Concerning the Presence of Citrate in Commercial Crystallized Bovine Serum Albumin[1]

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It has become a widespread custom to use Armour's crystallized bovine serum albumin, without pretreatment, as a representative protein in the study of the theory of ion-protein binding. This preparation is obtained from citrated blood by the procedure of Cohn *et al.* (*1*). It appears to be generally assumed that all but an insignificant amount of the citrate is removed by the crystallization process. However, during the course of an investigation of the binding of beryllium by albumin, it has been discovered that the commercial albumin preparation contains a significantly large amount of a strong complexing agent. Considering the relative binding strengths of the various possible contaminants, it is believed that this anion is citrate and is present to the extent of at least 0.5 moles/mole protein.

Beryllium begins to hydrolyze and polymerize near pH 4.6, even in concentrations as low as 10^{-9} *M* (*2*).

[1] This publication is based on work performed under contract with the U. S. Atomic Energy Commission at the University of Rochester Atomic Energy Project, Rochester, N. Y.

TABLE 1

DIFFUSIBILITY OF BERYLLIUM IN PRESENCE OF COMMERCIAL CRYSTALLINE BOVINE SERUM ALBUMIN, pH 7.5, 6° C*

Concentrations expressed in moles/liter × 10^4			
Albumin in bag		Be outside of bag†	
		Found	If 100% diffusible
Untreated No. 1‡	2.8	0.81	0.91
" " "	2.8	1.53; 1.64	1.82
" " "	2.8	1.54	5.45
Untreated No. 2‡	2.8	0.73	1.82
" " "	2.8	2.04	5.45
Predialyzed No. 1	6.6	0.16	5.45
" " "	2.0–6.0	0.13	5.45
Buffer only		0.07	

* 10 ml solution prepared in buffer (.05 *M* barbiturate, .10 *M* NaCl) dialyzed *vs.* 10 ml buffer for 16 hr on Boerner oscillating platform shaker.

† Be concentration determined by radioactive isotope counting technique (*2*).

‡ No. 1 and No. 2 represent two different batches of Armour's crystalline bovine serum albumin.

Under the conditions of the present experiments (Table 1), the concentration of beryllium in barbiturate buffer at pH 7.5 and 6° C capable of diffusing through a cellophane bag is 7×10^{-6} *M*. When 10-ml solutions prepared by adding varying amounts of beryllium chloride (spiked with radioactive Be^7 isotope) to 2% Armour's crystallized bovine serum albumin in buffer were dialyzed *vs.* 10-ml volumes of buffer, the concentration of diffusible beryllium increased to about $1–2 \times 10^{-4}$ *M* (Table 1).

It was possible to decrease the amount of beryllium solubilizer associated with the protein to a very small, but still detectable, value by dialyzing 50 ml 8% crystalline albumin in a rotating cellophane bag *vs.* 20 liters buffer (0.025 *M* barbiturate, 0.125 *M* NaCl) two successive times at 6° C for 24 hr each time. As is seen in lines 6 and 7 of Table 1, 1.3×10^{-5} *M* beryllium is diffusible in the presence of this predialyzed preparation. A calculation from the data of lines 2, 7, and 8 of Table 1 $\{(0.13 - 0.07) \div [1.6 - (0.13 - 0.07)]\}$ shows that roughly 4% of the original contaminant was still present even after the dialysis treatment.

The seriousness of the presence of such a strong complexing agent must be considered in any theoretical study in which the commercial preparation is used, even if the identity of the contaminant is not positively known at present. The following results, however, suggest that the contaminant is probably citrate.

From a consideration of the crystallization process of the albumin, it seems that the only beryllium-solubilizing agents that could possibly be present in appreciable concentration are citrate, acetate, bicarbonate, and protein-decomposition products such as amino acids. It is evident from the data of Table 2 that, of these substances, only citrate could conceivably be in sufficient concentration to account for the

TABLE 2

DIFFUSIBILITY OF BERYLLIUM IN PRESENCE OF SOLUBILIZING AGENTS POSSIBLY PRESENT IN COMMERCIAL CRYSTALLINE BOVINE SERUM ALBUMIN, pH 7.5; 6° C*

Concentrations expressed in moles/liter × 10^4		
Added substance, total concentration†		Be outside of bag at equilibrium‡
Buffer only		0.07 ± .005 (5)§
Sodium citrate	0.91	1.85 ± .03 (2)
Sodium bicarbonate	100	0.11
Sodium bicarbonate	500	1.30
Sodium acetate	100 and 500	0.07 (2)
Amino acids: glycine, .0001 *M*; DL and L aspartic acid, and D and L glutamic acid, .0001 and .01 *M*; arginine, .001 and .01 *M*; cysteine, .002 *M*; serine, .001 *M*; histidine, .005 *M*; tryptophane, .005 *M*; tyrosine, saturated solution		0.07 ± .02 (16)

* 10 ml buffer (.05 *M* barbiturate, 0.10 *M* NaCl) containing 7.26×10^{-4} *M* beryllium plus added possible complexers dialyzed *vs.* 10 ml buffer for 16 hr on Boerner oscillating platform shaker.

† Initial concentration in bag ÷ 2.

‡ Be determined by radioactive isotope counting technique (*2*).

§ Parentheses indicate number of experiments averaged.

diffusibility of beryllium in the presence of the unpredialyzed crystallized albumin.

Since near pH 7.5 one citrate ion can bind a maximum of two beryllium atoms (*3*), one can calculate the probable minimum amount of citrate present in the crystalline protein. The data of Table 1 indicate that 2.8 μM albumin contains at least enough citrate to bind 3 μM beryllium—i.e., at least 1.5 μM citrate. Because some mass-action effect is to be expected, a citrate/albumin ratio greater than 0.5 seems to occur.

It is also of interest that a sample of Fraction V albumin contained a considerable amount of beryllium-solubilizing agent even after dialysis of 50 ml of a 25% solution in a rotating cellophane bag three successive times *vs.* 20 liters distilled water at 6° C each time. When a solution containing 1.1×10^{-3} *M* of this albumin and 6×10^{-5} *M* beryllium was dialyzed *vs.* an equal volume of buffer, all the beryllium remained in a diffusible state.

The significance of these results with respect to beryllium-protein binding will be discussed elsewhere.

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Manuscript received June 16, 1952.

Added in proof: Citrate analyses, run in duplicate for each albumin sample, by the method of Saffran and Denstedt (*4*) indicate a minimum citrate/albumin ratio of 0.43 ± 0.04.

Comments and Communications

Of Spots Before the Eyes

THE observation of so-called flying disks in so many areas and the relative consistency in the description of these objects have led the writer to wonder whether they may not represent some form of natural phenomenon. Should these ephemera exist in the macrocosm, it is likely, if they are indeed natural phenomena, that they would be known to astronomers, meteorologists, and other observers of the atmosphere. Since the scientists have given no explanation of the oft-reported disks, it is necessary to ponder the problem of their existence in man himself and in spheres other than the psyche. A ready and reasonable explanation may be found in a smaller orbit, the eye of man. *Muscae volitantes,* the flitting flies we have all seen, may well be the "saucers" we wonder about.

Muscae volitantes is the term employed for the appearance of spots (motes) before the eyes. . . . They are caused by the shadows cast upon the retina by the cells normally found in the vitreous and are present in all eyes under certain circumstances, such as exposure to a uniform bright surface, or when looking through a microscope. They are found more frequently in errors of refraction (especially myopia), and the symptom may be aggravated temporarily during digestive derangements. They are annoying and sometimes alarm the patient, but are of no importance and do not affect the acuteness of vision. The treatment consists in correcting errors of refraction, or in relieving the disturbance of digestion. They often persist until the patient ceases to look for them and thus forgets their existence (*1*).

Anyone who has observed this visual phenomenon will recall that the object seen is brilliant and that it moves erratically, its erratic motion being a compound effect related to the motion of the shadow on the retina and associated movements of the eyeball and head. These objects also agree with some "observations" made on flying disks in that it is impossible to judge their distance or speed.

Another visual phenomenon which may be observed in the dark, as well as in the daylight, is the scintillating scotoma. Scotomata may be of various colors but otherwise are of uniform appearance as judged by the descriptions given by many persons suffering from migraine. They are of fairly consistent duration, usually lasting about 20 min, with an initial period of increasing density, then of stable appearance until they fade away. They are thought to be of cerebral origin (*2*).

It is thus likely, in the opinion of the writer, that flying disks are motes in the eyes of a dyspeptic microcosm or perhaps some abnormal cortical discharges in the migrainous.

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Editorial Prerogatives

EDITORIAL NOTE: *The Editorial Board has reluctantly but unanimously agreed to publish the following letter from K. H. L. Key, solely because it raises an issue on which the board members themselves are not in complete agreement, and which is bound to benefit from free and frank discussion. Dr. Key has informed the board of the name of the journal to which he refers—and the board has stipulated that its name shall be announced at the same time his communication is published. Although he has demurred, he has not withdrawn his request for publication, and the board persists in its stipulation for two reasons: It refuses to be party to the guessing game that would ensue if charges are made against an unnamed scientific periodical and it insists that fair judgment of any dispute depends upon the simultaneous presentation of both sides. For these reasons Dr. Key's charges are followed by a rejoinder from the editors of the* Quarterly Review of Biology.

FIVE years ago R. W. Gerard (SCIENCE, 106, 289 [1947]), made some excellent observations on the editing of scientific papers and editor-author relationships. I had made use of some of his points in trying to influence editorial practices in Australia, but it was not until some time later, when I came to submit a paper to a highly reputable American biological journal, that I was able to appreciate fully the criticisms made by Gerard of the methods of some editors. My experiences with that journal show that the arguments of Gerard and others have had no effect at all on some editors. A simple recital of the events as they occurred will, I think, be as effective as any amount of pleading, for they carry their own emphatic condemnation. They may perhaps serve to bring once more to the attention of scientists the very unsatisfactory situation that still exists in editor-author relations.

I submitted my manuscript—a lengthy review article—in July 1949. In November 1949, I was informed by the editor that it would be accepted for publication, subject to certain alterations that were necessary in order that the paper should conform to the style of the journal (e.g., deletion of the summary, incorporation of footnotes into the text, and changes in the list of references). The request for such alterations was, of course, reasonable and normal, and I met it fully. In January 1950, the editor informed me that he was now turning the altered manuscript over to an associate editor for "editing for the printer." In my innocence I imagined that this would mean the insertion on the manuscript of instructions to the printer regarding type style, spacing, etc.

To my complete surprise, in October 1950, I received a letter from this associate editor stating that the galley proof was on its way to me, and that it incorporated a number of changes that *he* had made in the manuscript. He outlined the principles he had followed in arriving at these changes, all of which related only to my use of English, and said he hoped

I would feel perfectly free to restore my wording in any instances where I thought the change had not been for the better. When the galley proof arrived on Nov. 3, it became apparent that several hundred changes had been made, few of which could be justified in my view, and many of which changed my meaning or were completely arbitrary. I was obliged to restore my original wording in a great many cases, although I did my best to avoid unnecessary restorations; I justified the restorations in a lengthy letter to the editor.

In a letter dated Dec. 5, the associate editor consented to only about one third of these restorations. He said he was forced to "cancel" the remainder, "unless you would like to pay for the alterations," which would cost some $71.00. Since the journal was due to be issued by the end of that very month, I cabled the editor that I had regretfully to insist that all my changes in the galley should be allowed to stand, and that I was trying to arrange for payment of the necessary $71.00. I confirmed this in an air mail letter, in which I explained that I had already accepted all the changes I could possibly agree to and that, if he could not accept my decision, I would have no alternative but to withdraw the paper. To the cable the editor replied, on Dec. 20, that he regretted that before my cable was received the galley was in the printing presses, and that "under no circumstances could I stop or interfere with the manufacturing schedule of the ——— Press." My air mail letter was never answered.

From this sorry little history the following facts stand out: (1) The paper that was published was not the same paper that I was told had been accepted for publication. (2) In spite of a period of nine months between the acceptance of the paper and my receipt of the galley, my first intimation of hundreds of important editorial changes was in the galley proof, less than two months before the due date for publication. (3) The editor's statement that I was free to restore my original wording was a gesture without any substance, because most of my restorations were "rejected." (4) The later implication that I could have all my restorations if I paid for them was quite improper. If the editor was in difficulties with his costs, that was due solely to the fact that he had allowed his own alterations to appear in the galley without taking the precaution to ascertain first whether they would be acceptable to the author. In any case, this supposed "offer" was as hypocritical as the assurance that I was free to restore my wording, for the galley had been returned to the printer before even a cabled reply could be received. (5) Statements were published under my name which I had expressly repudiated. Yet there was, of course, no editorial note to say that the author was not responsible for all the words attributed to him. (6) A paper was published which its author had explicitly withdrawn.

This whole correspondence, including the transfer of the proofs in both directions, was conducted by air mail (except where cable was used), so that the distance between Australia and the United States does not enter as a significant factor.

That the events recorded under (5) and (6) above could occur at all in scientific publications (except by some accident or misunderstanding) must come as a shock to many scientists. One would have supposed that no extenuating circumstances of expense, inconvenience, or delay could possibly be held to justify such action. The dangers, both to science and to the individual scientist, that such action implies are too obvious to need mentioning.

I have deliberately avoided any detailed consideration of the material points at issue between the editor of the journal and myself. My criticisms of the editor's procedure, and of the ultimate outcome, would, I consider, have full force even if it could be established that, on every question in dispute in regard to the text of my paper, strict interpretation of English usage showed the editor to be right and me wrong. If, however, the editor was in error in many instances, then the criticism is certainly strengthened. That this was in fact the case is shown, in part, by the editor's own admissions in correspondence and his acceptance of one third of my restorations. Further, the paper in its original form was approved for publication by the leading Australian scientific institution to which I am attached. The professor of English at the Canberra University College, who has studied both the original manuscript and a duplicate copy of the galley proof, has written to me as follows: ". . . I should say that in general the editorial changes made in the galley sheets do not appear to depend on any important question of style or grammar, and that, as far as English is concerned, I see no reason why the preferences of the author should not have been conceded."

All the documents in this case, including the duplicate galley proof with its restorations and the editor's "rejections," are on file.

K. H. L. Key

Division of Entomology
Commonwealth Scientific and Industrial Research Organization
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The editors of the *Quarterly Review of Biology* are sorry to have incurred the ire of their esteemed contributor K. H. L. Key, of Australia. At the same time, they would like it to be understood that the *Quarterly Review of Biology* has a literary tradition, as well as standards of scientific excellence, to maintain. All manuscripts are edited for clarity of expression, and ambiguities and inconsistencies of style are eliminated, insofar as possible. Some changes are no doubt trivial, but the over-all effect, it is hoped, is to improve without fundamentally changing the style of each author. During the past eight years, throughout which the present associate editor has edited the manuscripts of contributed articles, no contributor other than Dr. Key has made any complaint about the final wording or form of his paper. Many

have expressed appreciation. In the case of Dr. Key's manuscript the editor assumed that, like so many of us, Dr. Key was rather lax and inconsistent in the use of verb tenses. He now realizes, sadly, that Dr. Key is never lax or inconsistent, but always says precisely what he means.

It is our general policy, in handling manuscripts from foreign contributors, not to return the edited manuscript to the author prior to the printing of galley proof. The danger of lengthy delay in the mails or of the loss of a unique copy that embodies many days of editorial labor, is too great. Instead, galleys are printed on thin paper, and these are sent to the contributor by air mail, with a note that he is privileged to reinstate the original wording wherever the correct meaning has been altered or the change appears undesirable. This practice has in other cases always given mutual satisfaction to authors and editors, both before and since the present instance.

It would be most desirable if all manuscripts could be edited soon after receipt. Unfortunately, the editors of the *Quarterly Review of Biology* must do all their editorial work as a spare-time service to science without monetary compensation, and over and above their other duties. It is generally impossible to commence work on one issue until the preceding issue is in press. As Dr. Key's article was scheduled for publication in the issue of December 1950, the editing of his manuscript was begun in late August. It was due at the printer's on Oct. 5, and the galleys were sent to him on Oct. 27. By the time Dr. Key's returned galleys reached us, the issue in which his review was to appear was already in page proof. Since he had written repeatedly to urge more speedy publication of his paper, the editors preferred not to hold up its chance of publication in the issue for which it had been scheduled. The returned galleys asked for reinstatement of the original wording in 287 instances, and an accompanying letter justified many of these. In 131 instances (45.6%), including virtually all those justified by the author, the original wording was reinstated. Where the change in meaning appeared trivial and would at the same time require resetting of lengthy passages or entire paragraphs, the original wording was not reinstated. Alterations in proof must be made by hand, and are not only costly but also hazardous because errors commonly are introduced by the printer in making the corrections. In the case of page proof these errors, unfortunately, cannot be corrected. It may be pointed out, for example, that in making one correction of original wording desired by the author, the printer jumbled an entire line. One must decide whether making a change is worth the risk of further error, and decisions must often be made quickly to meet rigid printing schedules. The December number was scheduled to be issued on Dec. 22, 1950. When Dr. Key's air mail letter of Dec. 18 arrived, with the first intimation that he would withdraw the paper if his demands were not met, the issue was already printed and could not have been withdrawn either by him or by us. That we did not learn until too late of his adamant determination to insist on every item does not warrant or support his charge of hypocrisy.

Considering the present communication from Dr. Key to SCIENCE, the editors of the *Quarterly Review of Biology* feel that it is most strange that 13 months elapsed after the article was published without any protest to them from the author in the meantime. They had supposed he was quite satisfied by the acclaim with which the review was greeted. Since he evidently is not, they are willing to publish in the next issue of the *Quarterly Review of Biology* either of the following corrections, whichever one the author may prefer, although they feel that such corrections would more properly have been printed in the immediately succeeding issue of the journal. If, on the one hand, Dr. Key really feels that the paper is unrecognizable as his own, in spite of the opinion of the professor of English at the Canberra University College that the changes were not very important one way or the other, the following announcement can be printed:

> Dr. K. H. L. Key, to whom authorship of the review article "A Critique on the Phase Theory of Locusts" in the December 1950 issue of this journal was attributed, wishes it to be known that, because of editorial changes in the article, many of the views expressed are not his own, and he disclaims responsibility for them.

The alternative would be to publish, as is customary, a page of errata, reinstating each of the 156 disputed words—e.g.:

> P. 364, col. 1, l. 12: For "With these physical differences are correlated . . ." read "With these physical differences were correlated. . . ."
>
> P. 364, col. 1, l. 25: For ". . . ph. *migratoria* can be transformed into . . ." read ". . . ph. *migratoria* could be transformed into. . . ."
>
> P. 364, col. 2, l. 5: For ". . . which Uvarov quoted . . ." read ". . . which Uvarov quotes. . . ."

In conclusion, the editors of the *Quarterly Review of Biology* would like to indicate their complete agreement with the principles of good author-editor relationships outlined by Ralph W. Gerard in SCIENCE, and referred to by Dr. Key. In practice, the pressure of printing schedules often creates difficulties, as every editor knows. The author will sometimes have to choose between compromise or postponement of publication. For contributors abroad, as the present dispute reveals, a satisfactory agreement within the normal schedule may be impossible, and a more leisurely schedule should be adopted. In the more recent publication by the *Quarterly Review of Biology* of contributions from abroad, no difficulty has been experienced.

BENTLEY GLASS
CARL P. SWANSON
B. H. WILLIER

Department of Biology
The Johns Hopkins University

Book Reviews

Acids and Bases: Their Quantitative Behaviour. R. P. Bell. London: Methuen; New York: Wiley, 1952. 90 pp. Illus. $1.50.

This is another of the Methuen monographs on chemical subjects so invaluable as a pocket reference manual to specialists in the field.

A brief history of concepts and definitions of acids and bases is followed by a discussion of acid-base equilibria in water in the two introductory chapters. Acid-base behavior in nonaqueous solvents is treated in the third chapter, and interionic attraction in the fourth. The relation of acid strength to molecular structure, with special emphasis on organic acids is discussed in the fifth chapter. Under "Acid-Base Catalysis" the author covers such reactions as neutralization, deuterium exchange, catalyzed interconversion of tautomers, and the acid hydrolysis of esters. A brief discussion of the G. N. Lewis theory of acids and bases closes the book.

The text is accompanied by tables and graphs, with general references to periodicals. At the end of each chapter is a short list of general reference works and review articles. The author admits to incomplete coverage of the literature.

LOUISE ROTH
Department of Physics, Purdue University

Pharmaceutical Calculations. 2nd ed. Willis T. Bradley, Carroll B. Gustafson, and Mitchell J. Stoklosa. Philadelphia: Lea & Febiger, 1952. 290 pp. Illus. $3.75.

This book is based on the original text by W. T. Bradley. It is well organized and contains many desirable new features, such as a discussion of significant figures, problems in dispensing pharmacy, commercial pharmacy problems, the use of logarithms and exponentials, problems in H-ion concentration and pH. Stress is placed on significant numbers throughout the text.

Illustrated examples are well chosen and clearly explained. All ingredients used in problems and prescriptions are common to current pharmaceutical practice. The book adequately accomplishes the purpose of the authors—to furnish a text concerned exclusively with the arithmetic of modern applied pharmacy. Some may be concerned over the inclusion of such material as isotonic solutions, saponification value, and other chemical problems; these, however, are phases of practical pharmacy.

A satisfactory number of practice problems is included for each section, and a comprehensive set of review problems is included in the back of the book. The answers to the problems of certain chapters are given in full—for others only the answers to the odd-numbered problems.

The binding and printing of the book are of good quality, and the format has been modernized and made more attractive than the previous editions. This book would be a useful textbook for teaching the subject of pharmaceutical calculations and should prove useful to the student at all times for review of the arithmetic of pharmacy.

JOHN W. BOENIGK
M. L. NEUROTH
School of Pharmacy, Medical College of Virginia

Practical and Experimental Geography. W. G. V. Balchin and A. W. Richards. London: Methuen; New York: Wiley, 1952. 135 pp. Illus. $2.75.

This unusual book by two British geographers can be of infinite value in a very practical way to teachers of geography and natural science. As far as the writer is aware, it represents the first attempt to present under one cover a comprehensive collection of techniques, mechanisms, and diagrams for explaining geographical principles to students. Although the authors have aimed the book at the secondary teacher, it can be equally useful to the instructor of elementary courses of college level.

The book is divided into five parts of varying merit. The first, largest, and by far the best, presents a wide variety of devices by which earth-sun relations can be clearly and simply demonstrated. The mechanisms vary in complexity from a cardboard ball made from interlocking cardboard circles representing planes of meridians and parallels, to a mechanically ingenious tellurian constructed of Meccano parts, knitting needles, and rubber balls. Each is portrayed by clearly conceived and well-executed line drawings, and a list of necessary materials is included. Many of the ideas are novel and appear to have originated with the authors; others have been borrowed from British periodicals not widely circulated in America.

The next three parts (landforms, meteorology and oceanography, and mapping) are much less original and far too brief. Some aspects are quite surprising—for example, the authors are apparently not aware that protractors may be graduated in per cent. Their mapping methods measure vertical angles in degrees, with the resultant involved calculations.

Although nothing new is presented in the final section on cartographic devices, it does give a collection of useful techniques for a beginning teacher.

Despite its weaknesses, this handy reference book should be available to teachers and college instructors. It is practical, its suggestions are always feasible, the materials used are readily available, and the directions and illustrations clear and lucid. If the request of the authors for additional ideas is heeded, a future edition, expanding the weaker portions of this first edition, should make an outstanding work.

RICHARD F. LOGAN
Department of Geography
University of California, Los Angeles

Meetings & Conferences

Dec. 26–30. American Physical Society. Naval Ordnance Test Station, Inyokern, and California Institute of Technology, Pasadena, Calif.

Dec. 26–31. American Association for the Advancement of Science (Annual). Hotel Jefferson, St. Louis.

Dec. 27–28. American Chemical Society. Division of Industrial and Engineering Chemistry (Annual Chemical Engineering Symposium). Evanston, Ill.

Dec. 27–29. American Mathematical Society (Annual). Washington University, St. Louis.

Dec. 27–Jan. 3. Basic Seminar in General Semantics. Institute of General Semantics, Lakeville, Conn.

Dec. 28. International Union Against Cancer and International Cancer Research Commission. Bombay.

Dec. 28–29. Committee for the Scientific Study of Religion. New York.

Dec. 28–30. American Anthropological Association. Philadelphia.

Dec. 29. Society of the Sigma Xi (Annual). St. Louis, Mo.

Dec. 29–31. Econometric Society. Chicago.

Dec. 30. Mathematical Association of America, Inc. Washington University, St. Louis.

Jan. 9–10. American Group Psychotherapy Association (Annual). Henry Hudson Hotel, New York.

Jan. 12–16. Society of Automotive Engineers (Annual). Sheraton-Cadillac Hotel, Detroit.

Jan. 13–16. Highway Research Board (Annual). National Academy of Sciences–National Research Council, Washington, D. C.

Jan. 14–16. Conference on High-Frequency Measurements, sponsored by American Institute of Electrical Engineers, Institute of Radio Engineers, and the National Bureau of Standards. NBS, Washington, D. C.

Jan. 17. Symposium on Blood (Annual). Wayne University College of Medicine, Detroit.

Jan. 19–23. American Institute of Electrical Engineers (Winter General). Hotel Statler, New York.

Jan. 20–31. Inter-American Congress of Philosophy. Havana.

Jan. 22–24. American Physical Society (Annual). Harvard University, Cambridge, Mass.

Jan. 26–27. Compressed Gas Association, Inc. (Annual). Waldorf-Astoria Hotel, New York.

Jan. 26–29. American Society of Heating and Ventilating Engineers (Annual). Conrad Hilton Hotel, Chicago.

Jan. 26–30. International Heating and Ventilating Exposition. International Amphitheatre, Chicago.

Jan. 30. Public Health Workshop, First District Dental Society of the State of New York. Hotel Statler, New York.

Jan. 30–31. Conference on Protein Metabolism (Annual). Bureau of Biological Research, Rutgers University, New Brunswick, N. J.

Jan. 30–31. Western Society for Clinical Research (Annual). Carmel, Calif.

Feb. 2–4. Symposium in Fundamental Biology. Michigan State College, East Lansing.

Feb. 4–6. Western Computer Conference. Hotel Statler, Los Angeles.

Feb. 5–7. Southwestern IRE Conference and Electronics Show (Annual). Plaza Hotel, San Antonio.

Feb. 12–13. Southern Weed Conference. Jung Hotel, New Orleans.

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